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ABSTRACT

This report describes the conceptual framework of a study examining the feasibility of developing, on a nationwide basis, a system of statistical indicators of educational knowledge outputs, dissemination structures, and knowledge utilization settings and outcomes, along with their contextual indicators. Using the notion of social indicators to measure educational knowledge production and utilization, a model of a functional system of indicators consisting of four major components was developed: (1) production output indicators reflect the extent and ways in which the educational knowledge production community organizes and transforms knowledge in all its forms; (2) dissemination structure indicators display how resources are allocated across educational sectors and geographic areas; (3) utilization indicators provide information regarding request and usage rates by geographic or educational sectors for types of institutional and individual consumers of educational knowledge, products, and services; and (4) contextual indicators may be used to predict or explain the patterning of other types of indicators using demographic and geographic data. These indicators are examined in terms of major dimensions that may prove useful in a conceptual mapping of the indicator domain, and then in terms of implications of this dimensional mapping for the selection or development of indicators. (Author/CWM)

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INDICATORS OF EDUCATIONAL KNOWLEDGE PRODUCTION, DISSEMINATION, AND UTILIZATION: A CONCEPTUAL FRAMEWORK

Paul D. Hood

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PREFACE

One of the general objectives of the Educational Dissemination Systems Support Program (EDSSP) is to establish efficient means for analyzing, monitoring, and communicating the status, needs, and accomplishments of dissemination performers. Previous EDSSP reports have described various aspects of educational dissemination including: synthesis of key studies (Emrick and Peterson, 1978), analyses of dissemination and linking roles (Butler and Paisley, 1978; Hood and Cates, 1978; Cates, 1978), cost analyses of services (Paisley, Blackwell, Emrick, Rittenhouse and Cooper, 1978), and descriptions of specific programs and organizational arrangements (Adams, 1978; Blackwell and Hood, 1978; Hood, 1978; Lotto and Clark, 1978; Paul, 1978; Rogers, 1978).

In this and two companion publications, we address the feasibility of developing, on a nationwide basis, a system of statistical indicators of educational knowledge production outputs, dissemination structures, and knowledge utilization settings and outcomes, along with their contextual indicators. This report describes the conceptual framework and briefly summarizes some empirical work.

EDSSP work on indicators may be traced to interest in examining statewide inter-organizational arrangements (Paul, 1978). If a few states were selected for intensive case study, which states would be most representative? How could states be typed? Was there any objective basis for typing states? Exploratory work (Hood and Blackwell, 1979) demonstrated that one could produce useful typologies based on either (a) statistical indicators of educational knowledge production and dissemination capacity or (b) contextual demographic, economic, and educational data. State-level indicator data could be aggregated to produce regional indicator data. In a companion EDSSP study of issues concerning equity

of access to information by various groups, Paisley, Cirksena, and Butler (1979) accomplished the more difficult feat of disaggregating educational knowledge indicator data down to local-levels.

As we prepared these two exploratory studies for publication, it became apparent that much of the conceptual framework on which these studies were based was "in our heads." Some kind of an explicit description was needed. What began as a brief outline of our conceptual apprdach has become this small monograph that attempts to develop a comprehensive taxonomy.

Following an introduction and overview of the framework, each of four indicators areas (production outputs, dissemination structures, utilization, and contexts) are discussed, first in terms of major dimensions that may prove useful in a conceptual mapping of the indicator domain, and then in terms of implications of this dimensional mapping for the selection or development of indicators. The four sections are uneven in length. The discussion of knowledge base output indicators is long because several of the dimensions are relatively novel, but have significant implications for analysis of the knowledge base. The section on dissemination structures and functions is terse since it is possible to reference several relevant publications. The section on knowledge utilization is quite long. In this section we summarize and critique several lines of inquiry that tend to employ different conceptualizations of knowledge uilization. After outlining major dimensional categories that encompass these lines of inquiry, we describe and critique available methodological approaches to the development of utilization indicators and then discuss the current situation. The section on contextual indicators provides a brief descriptions of various types of contextual indicators and their possible uses. This is followed by a short section summarizing the exploratory data analyses reported by Hood and Blackwell (1979) and Paisley, Cirksena, and Butler (1979). A concluding section reviews the conceptual framework and comments on its potential uses.

INTRODUCTION

The Educational Dissemination Systems Support Program (EDSSP) has three general objectives: 1) to establish an efficient means for analyzing, monitoring, and communicating the status, needs, and accomplishments of educational dissemination performers; 2) to increase the quality of and access to knowledge pertaining to the educational dissemination and utilization (D&U) process; and 3) to establish a "participatory" capacity for organizing and conducting special studies contributing to the improvement of educational dissemination as a regional and nationwide effort.

With respect to objective 1, EDSSP staff completed an analysis of significant recent or current efforts to define the status, needs and acomplishments of educational dissemination performers and has published two reports, one focusing specifically on purposes and methods employed by current NIE-sponsored activities and the second describing results of recent studies and current descriptions:

- Blackwell, L.R. and Hood, P.D. Program Intelligence Activities in Educational Knowledge Utilization: Comparison of Sensing, Feedforward, Monitoring and Evaluation Concepts in Five NIE-Sponsored Programs, (Far West Laboratory, June 1978).

- Hood, P.D. Statewide Educational Dissemination Capacity: A Review of Recent Literature and Current Information, (Far West Laboratory, August 1978).

Our analysis indicated that there are many on-going efforts to describe or evaluate various aspects of educational D&U. However, the great majority of these efforts tend to focus on specific agencies (e.g., State Education Agencies), functions (e.g., information retrieval and distribution) or programs (e.g., the National Diffusion Network, or the R&D Utilization Program). We can discern the beginning of more comprehensive coverage as evidenced in the "base-line"

studies of the R&D Exchange (see for example, An Overview of State Dissemination Activities, R&D Exchange, May 1978) or the recently initiated "A Study of Dissemination Efforts Supporting School Improvement" (sponsored by USOE and conducted by the NETWORK of Andover, MA). But there is nothing approaching a truly comprehensive (i.e., multi-agency, multi-function, multi-program), nationwide picture of educational dissemination.

A second characteristic of much of the existing information is that it is primarily "qualitative" (e.g., descriptions of programs, activities, persons). In only a few cases can we find "quantitative" information that has been collected with sufficient care that there is a trustworthy basis for projecting to entire populations.* In an effort to deal with the lack of a nationwide picture and the paucity of quantitative data, EDSSP staff began to build a quantitative data base for the 50 states (and DC) and to conduct exploratory studies of how this data base could be used to describe educational D&U status. This report describes the conceptual framework that guides the development of the data base. Two related reports (Hood and Blackwell, 1979; Paisley, Cirksena, and Butler, 1979) present results of exploratory data analyses.

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* These exceptions tend to be either dated or of limited scope. Brickell (n.d.) completed a survey of research, development, demonstration, dissemination, and evaluation projects and personnel but it was confined to State Education Agencies and conducted in 1969-70. Emrick, Peterson,and Agarwala-Rogers (1977) provide a comprehensive description of the National Diffusion Network, 1974-1976. Clark and Guba (1977) and Lotto and Clark (1978) provide a recent study of the role of schools, colleges, and departments of education (SCDEs) in KPU, that premits projection to the majority of SCDEs. The NIE-sponsored American Registry of Research Organizations in Education (Bureau of Social Science Research, in preparation) will provide very limited information on amount and percentage of funding and numbers of personnel engaged in "dissemination" in more than 2,500 organizations

CONCEPTUAL FRAMEWORK AND APPROACH

The notion of "social indicators" (Bauer, 1966; Sheldon and Moore, 1968; Gross, 1969; Van Dusen, 1974) plays an important role in the approach that we have taken. Social indicators are measures of status or of changes in status of aspects of society.* In the field of education there are several examples of the use of indicators, e.g., to assess educational outcomes (Cobern, et al., 1973), to assist in institutional accreditation (Gingras, 1975; Walters, 1977), to augment "accountability" program assessment (Clemmer, et al., 1974; Grady, 1974), or to measure general educational status and trends (Ferris, 1969; ETS, 1976). Generally, educational indicators have dealt with student enrollment demography (e.g., age, race, sex, grade level, retention rates, ability grouping), with achievement levels (e.g., degrees earned, test results) or with staff demography, institutional characteristics (e.g., size, programs, facilities) or fiscal data (e.g., levels and sources of funding, levels and types of expenditures). Although relatively few of the commonly available indicators have a direct bearing on educational knowledge production, dissemination or utilization, some of them (e.g., size and type of staff, number and type of institution, level of funding) might serve as "contextual" variables that would likely be related to educational knowledge production, dissemination or utilization.

Underlying our thinking about the use of social indicators to measure educational knowledge production and utilization has been a model of a functional system of indicators consisting of four major components:

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* "A social indicator...may be defined to be a statistic of direct normative interest which facilitates concise, comprehensive, and balanced judgments about the conditions of major aspects of society." Toward a Social Report (DHEW, GPO, 1969).

1) indicators of educational knowledge production outputs;*

2) indicators of educational knowledge dissemination structures;

3) indicators of educational knowledge utilization;

4) indicators of contextual factors that may be used to predict or explain the patterning of the other types of indicators.

Production output indicators are concerned with estimates of the type, quantity, quality or other characteristics of quantifiable units of educational knowledge (e.g., documents) as related to their orgin (e.g., author or institution location). Ideally, these indicators should reflect the extent and ways in which the educational knowledge production community organizes and transforms knowledge in all its forms. Currently available data pertain primarily to formal documentary or formal oral forms or their derivatives (e.g., abstracts, citations, proceedings).

Dissemination structure indicators are concerned with the characteristics or capacity of structural or functional components of the educational dissemination system (e.g., number and type of information search services, number and type of linking agents). In general these indicators should display how educational dissemination resources - funds, people, products, services, and technology are allocated across educational sectors and geographic areas.

Utilization indicators should provide information regarding request and usage rates, adoptions, impact, benefits, etc., by geographic or educational sectors for types of institutional and individual consumers of educational knowledge, products and services. Currently there are very few satisfactory utilization indicators, available on a nationwide basis, that can be used to inform us regarding the various facets of knowledge utilization or its impacts.

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* Note that we have excluded concerns with how knowledge is created, that is, with the structure and processes of knowledge production.

Contextual indicators provide information concerning distribution across geographic areas of changing composition and trends of aggregative data that reflect the demographic, organizational, social, political, economic, and educational environments for educational knowledge production, dissemination and utilization. Contextual indicators can reflect conditions or forces that may serve to supply, support, constrain or otherwise influence the production, dissemination, or consumption of educational knowledge.

Relationship among types of indicators. Because of the sometimes highly local connections of production, dissemination, and utilization (e.g., within an immediate primary group or within one organization), it should not be surprising to find strong correlations between some types of production, dissemination and utilization indicators, especially those that may be based on counts of units or entities. However, there is also strong reason to suspect that contextual factors (e.g., population density, per capita wealth) might constitute common underlying factors that may account for much of the observed correlation between production and dissemination indicators or between dissemination and utilization indicators when aggregated by region or state. For example, one might expect that more populous states or regions would display higher counts of publications, higher numbers of information search services, and higher numbers of organizational and individual requests for information searches than would less populous states or regions. It is also easily conceivable that relatively wealthier states and regions could afford to fund more knowledge production (e.g., research studies, innovative practices), support more extensive and expensive dissemination services, and create educational consumer environments with the organizational "slack" and incentives fostering less parochial forms of knowledge consumption. Hence contextual indicators need to be considered when examining aggregate data.

Although an extreme simplification, we may conceive of the four sets of indicators as being related as depicted in Figure 1.

The general conceptual framework depicted in Figure 1 provides a basis for going beyond simple description to an analysis of relationships among indicators within sets, and between indicators in different sets. In our exploratory analyses, we depended on a limited set of indicators that could be easily located or constructed from existing sources. However, a more systematic and detailed framework is required for identifying indicators, if only to reveal the limitations and biases of the more accessible indicators or, hopefully, to point to significant gaps where special efforts may be required to develop a more comprehensive set of indicators.

In the following sections we first define some terms and then we examine in detail sets of dimensions that may prove useful in classifying or "mapping" indicators relating to 1) the knowledge base, 2) the formal dissemination structure, 3) the knowledge utilization area, and 4) context variables.

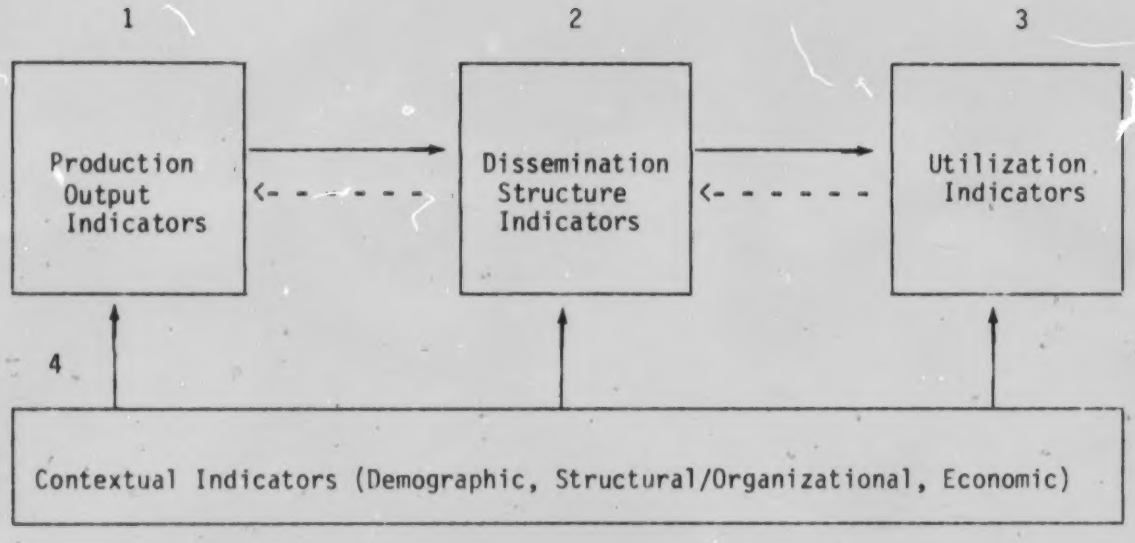
The Concept of Knowledge and Its Relation to Indicators of Educational Knowledge*

One of the attractive aspects of the term "educational knowledge production and utilization" is that it is such an all encompassing concept. But this also poses severe problems if we are to select or build indicators of educational knowledge production, dissemination, or utilization. To some degree we run the risk of limiting our ideas to those that are familiar or conventional and our indicators to those that are conveniently accessible. Consequently, before describing the construction of dissemination or utilization indicators, we need to digress to outline some ways of conceptualizing the body of educational knowledge production. We begin by presenting some simple definitions and will then proceed to examination of several analytic dimensions.

* Portions of this section are developed more completely in Hood (December 1978) and Hood and Cates (1978).

FIGURE 1

A SIMPLE CAUSAL MODEL OF RELATIONSHIPS AMONG SETS OF EDUCATIONAL KNOWLEDGE INDICATORS



Data are coded symbols, signs or numerical indicators, or the unprocessed stimuli that are "raw" data. Information is data that has been subjected to some form of processing (e.g., recoding, summarization, collation). Intelligence consists of information that has been communicated to others, usually with an accompanying interpretation or evaluation of meaning or pertinence. Technology transforms information and produces products, processes or programs that can still be regarded as information-bearing. Knowledge (in its broad sense) refers to the total body of data, information, intelligence, and technology and to their organizing structures and principles, (i.e., the sum of all that is known). Knowledge production and utilization (KPU), as a field of study, is concerned with an examination of the processes of knowledge production, dissemination, and utilization, and the factors that account for the character and timing of those processes, and with developing strategies and tactics that foster appropriate, timely, and effective utilization. Knowledge transfer is sometimes used as a completely synonomous term with knowledge utilization, but in other uses is confined to the communication/dissemination/diffusion phases of the KPU process (thus excluding production and sometimes the incorporation and adaptation phases of the utilization process).

Educational KPU overlaps with information science and the field of communication studies, that have, in turn drawn on a broad range of physical, social, and behavioral sciences and technology. Consequently there is no dearth of disciplinary orientations for viewing educational KPU, but there is a distinct possibility that vastly different perspectives may be taken by different investigators depending on their professional, disciplinary, or problem orientations. There is also a strong possibility that particular perspectives may tend to omit or ignore aspects of KPU that are not central to the perspective.

KNOWLEDGE BASE DIMENSIONS

Dimensional Analysis of the Educational Knowledge Base

At a practical level, it is our belief that a truly comprehensive approach requires us to examine the full range of the educational knowledge base mapped against several facets or dimensions. These include:

- Subject Matter Content
- Structure
  - Form
  - Level of formality
  - Formats
  - Collections and systems
- Organization of "Knowledge Units"
  - Tangible/intangible character
  - Independence/interactivity
  - Separable/inseperable character
  - Audience orientation
- Basis
  - Disciplined inquiry
  - Sponsorship

Such a mapping is desirable if only to gain some idea of what one proposes to include or where emphasis will be placed.

Content

Subject Matter Content. The significance of this dimension is well known to librarians and information specialists who are concerned with classification, cataloguing, indexing, design of information systems, etc. The scope of the information base, the way it is organized and indexed, and the way users approach it when searching for information or attempting to use it can have profound influence on the character and effect of information production, dissemination, or usage, as well as on the costs and benefits that may be associated with any type of organized information activity. Because significant portions of at least

the formal documentary knowledge bases in education are content classified, it is possible to examine, at least grossly, the distributional properties and effects of subject matter content. This can be done by cross classifying many knowledge production indicators in terms of their subject matter content.

Structure

Forms of knowledge. There are several very general forms in which knowledge is presented or communicated. These include: oral forms, document forms, nondocument forms and references (to other forms).

Levels of formality. Each of these forms are encountered at various levels of formality ranging from highly formal to very informal.

Formats. In Figure 2 these last two dimensions have been crossed. Within each cell of Figure 2 are found various common examples of formats in which knowledge is stored or communicated. In general, the less formal the level, the more difficult it is to obtain or to develop educational knowledge base indicators. Nearly all our easily obtainable indicators are associated with the formal level. Research in Education (RIE) is perhaps one of the few national bases in education that provides some help in assessing the character and content of semi-formal documents.

There are also major problems in identifying or developing indicators for oral forms of knowledge. Only a very small portion of the most formal oral forms (e.g., a professional meeting or a national conference) is documented and referenced in easily accessible formats (e.g., proceedings, meeting program abstracts, convention programs).

Studies of communication modes for technical information indicate that approximately 60 percent of the information used by individuals in their work is obtained in the interpersonal mode, either face-to-face or by telephone.

FIGURE 2

CLASSIFICATION OF STRUCTURAL FORM BY LEVEL OF FORMALIZATION

LEVEL	ORAL FORMS	DOCUMENT FORMS	NON-DOCUMENT MATERIALS	REFERENCES (to oral forms, document forms, and materials)
FORMAL	International National Regional meetings symposia conferences panels	Reviews, reprints, proceedings, preprints, journal articles, reference works, anthologies and collections, hard-cover books, soft-cover books, micro-forms	Published Materials: textbooks, workbooks, case studies, manuals, guides, tests, videotapes, films (slides, strips, movies), audio (records, tapes), displays, equipment, games, kits, computer software	Citation Services: meeting program abstracts abstract journals listing of manuscripts received current awareness book reviews Review Articles: collection synthesis Subject Bibliography: unannotated annotated evaluated Library Catalogues & Indexes
SEMI-FORMAL	Colloquia Seminars Special conferences Telephone conferences	Final reports, technical notes, technical memos, progress reports, technical reports, proposals, speeches, unpublished papers	Draft and test forms of any of the above instructional materials	References cited in journal articles, books, reports, theses Catalogues, advertisements, and publishers' materials Librarians Conference presentations Advertisements in journals
INFORMAL	Conversations Telephone calls Correspondence Casual meetings Unplanned encounters	Manuscripts, drafts, memos, correspondence, notes, outlines (document)	Treatments, outlines (I.M.), scripts, story boards, mock ups, renderings, flow charts, prototypes, sketches, designs, specifications	Journal contents & library book shelves Personal report team files Personal index files Conversations Correspondence Requested document distribution Unrequested document distribution Symposia Local meetings

Forty percent shows up in written form, of which 25 percent is informal (e.g., correspondence, circulars, forms, photographs) and only 15 percent is formal (and therefore subject to bibliographic control). The Education Market Study (Hood and Blackwell, 1976; Hood, Mick, and Katter, 1976) suggests that the proportional use of oral and written and of formal and informal information does vary with type of educational audience (e.g., instructional staff, administrators, governance groups), but that most of these differences are not very large. The implication is that educational knowledge indicators that are based on items that are under bibliographic control, and this includes virtually all the measures that are commonly available, can, at best, reflect only 10 to 15 percent of the technical information that may be used in educational work. The actual amount that is indexed and easily accessible is probably not much more than one or two percent. Most of what we know about the educational knowledge base tends to be highly biased on these two dimensions of form and formality. For the present, there are few alternatives to working with available document-oriented systems (e.g., ERIC, Citation Indexes, books in Print, product or program catalogues); however, we must remain aware of this severe form/formality bias. The small scale studies comparing oral and written or formal and informal communication content leave us with scant hope that the conclusions we may draw, based on formal documentary sources, will be even broadly generalizable to oral forms or less formal document forms.

Collections and systems. In Figure 2 the six upper right hand cells have been heavily outlined. These cells tend to represent the tangible holdings of various organized libraries and information services. Knowledge production data pertaining to the quality, character, and distribution of knowledge appearing in these formats are generally much easier to acquire or estimate.

Most "local" knowledge bases also include the informal categories of the tangible forms. Because these local bases are so numerous and diverse in their character we tend to have relatively little useful information concerning them except in special cases, e.g., libraries, media centers, or educational data systems. Even in these special cases most of the available data concerns the way these collections are organized, staffed, and funded. Other than for gross data on size and type of library holdings, there is virtually no data on informal categories of information.

Organization

In the previous section we focused on how knowledge tends to be structured by form, formality, format, and in terms of collections, services and systems. In a strict sense, data, information or knowledge is contained or conveyed within these formats. After we identify and obtain or gain access to the format item, we still must locate the data or information we may be seeking. Typically several sources and usually more than one type of source is used. Libraries, media centers, and information systems all strive to organize their holdings to facilitate efficient storage and retrieval. However, in this section we are concerned with how the knowledge itself is organized or "packaged" for use, not with how the formats are organized for storage or retrieval.

At a molar level there seem to be three or four somewhat interrelated dimensions along which we can grossly sort or classify knowledge in terms of its organization.* These are:

- Degree of tangibility - intangibility
- Degree of independence - interactivity
- Separability - inseparability
- Audience orientation

* There are many other conceptions of the organization of knowledge that relate to epistemology, the sociology of knowledge, rhetoric and logic, perception and learning, effective communication, propaganda and persuasion, etc. These may or may not be related to specific examples of the organized types of knowledge (i.e., products, programs, practices) that are discussed in this section.

Guba (1968) outlined four sets of assumptions which need to be determined in terms of dissemination policy. One of these was "Assumptions concerning the substance of the product, program, or knowledge to be disseminated." Hood 1976) examined various facets of this assumption in a paper titled "Analytic Summary of Considerations Affecting Dissemination." Hood noted that the content of educational knowledge needed to be conceptualized in terms of several dimensions. One of the most powerful of these is a complex dimension indexing the degree of tangibility, independence, and separability of the "unit" to be disseminated. He noted that educational products (e.g., textbooks, educational films) are highly tangible and may be isolated and chosen for use as relatively independent entities. On the other hand knowledge per se (e.g., thought, ideas, tacit knowledge) is intangible, and usually highly interactive with other knowledge, i.e., facts and ideas usually find their meaning and utility only in the context of other knowledge. It is sometimes hard to separate a piece of knowledge from its context. Educational programs and practices tend to occupy an intermediate position between highly tangible products and intangible ideas. Some programs and practices are well defined and documented in terms of textbooks, teachers' guides, program management aids, and other instructional materials or documentation. However, virtually all programs have some inherently intangible elements, and some programs and practices (e.g., team teaching, peer tutoring) are primarily intangible. When their essential character is not easily communicated, they may be highly susceptible to misinterpretation; attempts at replication may vary widely. Dissemination and utilization of the latter is qualitatively different from dissemination or utilization of a textbook.

The characteristics of independence and interaction are similarly important. It is rare that a particular program will work everywhere. A program

that could be highly successful in one context may have an extremely unfavorable prognosis in another. To the extent that programs are highly interactive they pose special problems for evaluation, for distributor and consumer choice among alternatives, and for achieving effective implementation.

Audience-orientation. This facet of knowledge organization tends to become increasingly relevant when knowledge is more highly organized (e.g., products, programs, knowledge syntheses, information systems). And to a significant extent it is a derivative of the interactive character of these more organized forms of knowledge. If these organized forms do not work equally well everywhere, this implies that there are many choices in terms of how knowledge is organized and communicated (e.g., regarding types of users, settings and conditions, degree of effort the user must exert to acquire, understand, evaluate, use, etc.). For instance, an information analysis product may be research-oriented or practice-oriented; if practice-oriented it may be designed especially for administrators, for content specialists, for teachers or for the lay public. Depending on how the knowledge is organized the "difficulty" or "cost" (to obtain, understand, evaluate, apply, etc.) may be relatively high or low; this level may match or mismatch the users' capacity or difficulty/cost threshold or ceiling. (Items can be too hard; they can also be too easy.)*

Basis

R&D basis. Educational knowledge can be classified by content, structure, and organization. Another dimension that tends to be especially important to the educational R&D community and that may or may not be of importance to the

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* From the user's point of view there is a complementary concept of user significance, i.e., how these more organized forms of knowledge are perceived and evaluated by users. Rogers (1962), Havelock (1969), Rogers & Shoemaker (1971), Zaltman, Duncan, & Holbek (1973), Glaser (1973), Sikorski & Hutchins (1974), offer a variety of dimensions that relate the attributes of innovations to user significance.

educational practice community relates to the extent that knowledge, in its various organized forms and formats, is based on disciplined inquiry. Some products, programs, and knowledge are the results of a high degree of disciplined inquiry (i.e., the outcomes of rigorous research, development or evaluation processes); others may be only remotely based on or poorly verified by disciplined inquiry. The vast mass of educational products, practices, and less tangible forms of knowledge tends to have only remote association with any form of disciplined inquiry, despite in many cases having survived the test of time.

Cross-classification of organization and R&D basis. Figure 3 presents a three dimensional depiction. For the moment we shall confine our attention to the front face where we have conjoined the two dimensions of organization and of R&D basis, and have arbitrarily mapped out nine regions.* Beginning at the top left we find the tangible products of R&D. Progressing to the right, the R&D products shade into R&D based or validated programs. As these programs become increasingly intangible, they shade into "synthesized" (e.g., practice-oriented) research based knowledge (e.g., regarding practice and theory) and then finally into highly intangible, abstract, and generalized or fragmented R&D-based knowledge.

As we proceed across the next row we encounter the same forms of organization; however the "validity" of knowledge at this second level is based far less on the R&D (disciplined inquiry) process and far more on pragmatism. Successful products are usually those that are marketable, profitable, and able to win and maintain consumer acceptance. Promising practices may be purely practioner innovations that have neither an R&D basis nor evaluation data to prove their claims, but that are judged to be worthy or promising by competent

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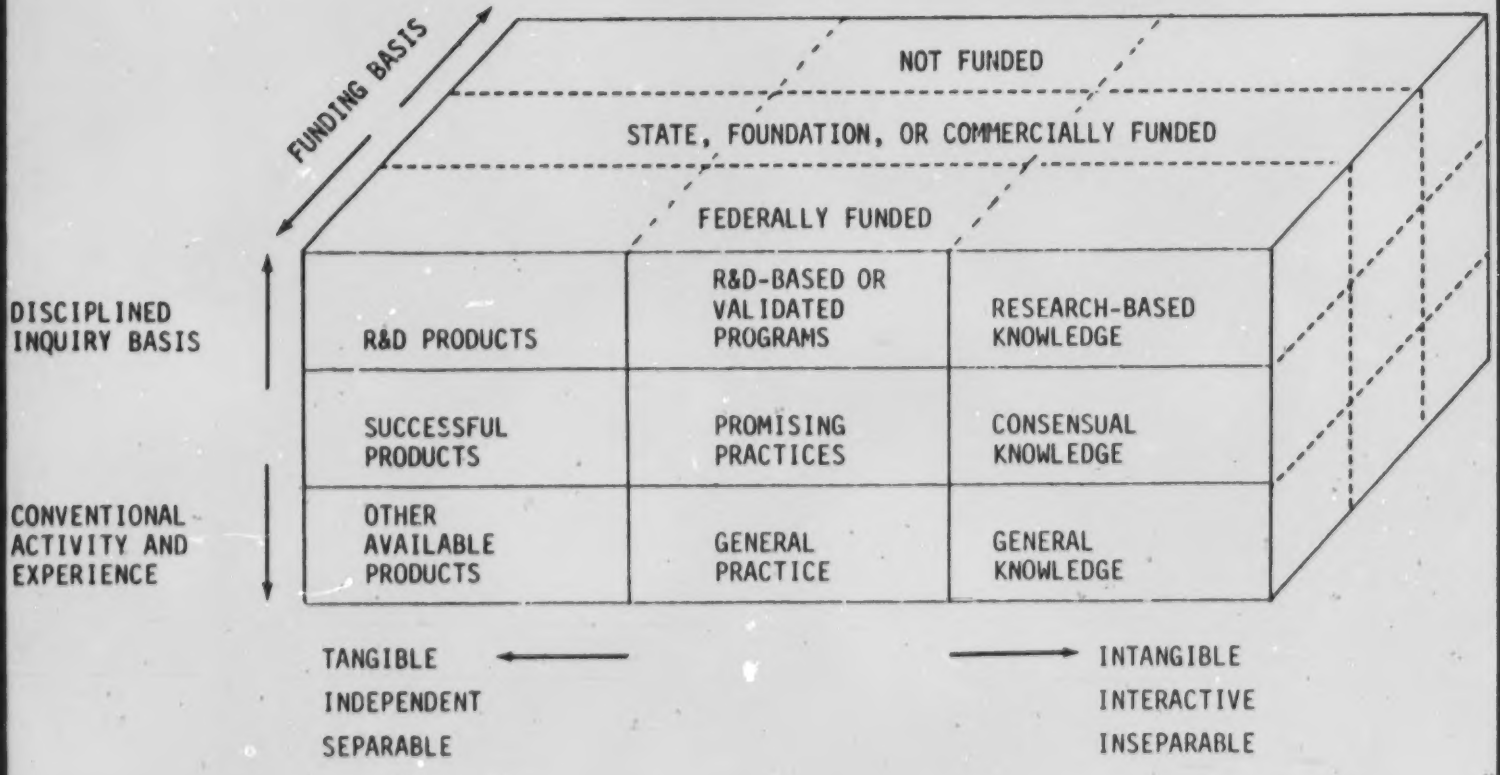
* This section appeared in Hood (1976) and has been reprinted in DAG (1977) and Crandall (1977).

FIGURE 3

A CONCEPTUAL MAPPING OF EDUCATIONAL PRODUCTS, PROGRAMS, PRACTICES, AND KNOWLEDGE



educators. Consensual knowledge is not produced by disciplined inquiry or scholarship, but it is accepted as valid and reliable by the consensus of those who must rely on it.

In the last row we encounter a vast grey area of relatively unvalidated products, practices, and knowledge. Their "validity" depends primarily on the prevalence of their use and on their utility for specific users. Credibility and utility are the operating criteria that separate the useful from the useless.

Sponsorship. The third dimension in Figure 3 refers to the source of sponsorship or funding that produced the knowledge or that supports the dissemination of various forms of knowledge. From a Federal (or a State) government perspective, the question of the degree of government funding (all to none) may be a nontrivial issue. For instance, only federally supported products are described in the two-volume Catalogue of NIE Educational Products, only federally supported (and JDRP-approved) programs appear in Educational Programs That Work. Only these federally sponsored programs are eligible for dissemination through the National Diffusion Network. Nonfederally funded information does appear in Research in Education, but federally funded R&D project reports are far more likely to be accessed by RIE than reports of nonfederally funded projects. Federal funding is thus something more than simply an issue of whether financial resources are provided to produce knowledge, it also may affect the method and extent to which the knowledge may be documented, referenced, and disseminated. Although less pervasive, state education agency sponsorship sometimes operates in similar ways in the selective filtering of knowledge that the SEA communicates (Elwell and Dwyer, 1979).

Sponsorship of knowledge by other types of agencies (e.g., nonprofit foundations, commercial firms) also may significantly affect visibility, access, and dissemination of more organized forms of knowledge (e.g., foundation sponsored programs, commercially promoted products or services).

In general, sponsorship interacts with degree of knowledge organization. Investments are required to bring knowledge to more organized forms (e.g., products or transportable programs and practices). These investments are justified if these forms of knowledge are sufficiently utilized. Hence production of more organized forms of knowledge tends to become linked with organized forms of dissemination. Because of proprietary interests, this sponsorship tends to be highly segmented, e.g., between government, foundations, and commercial sectors, or among various government or commercial subsectors.*

Implications for Development of Education Knowledge Base Indicators

In the previous section we have described four major dimensions (and several subdimensions) that can be used to map the educational knowledge base. These were: content, structure, organization, and basis. These dimensions can be used to define the scope and nature of our knowledge indicators and to alert us to biases that may exist.

Content. We noted that knowledge is often classified by subject matter content, and that it is therefore possible to examine at least those parts of the base that have been classified or indexed in terms of the estimated absolute or relative amount and kind of knowledge in various major content areas.** There are a number of technical problems that make this kind of effort quite

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* Less organized forms of knowledge (e.g., results of fundamental research, applied research or evaluation studies) tend to be segmented more powerfully by content (as reflected by disciplinary orientation, by sub-field of the educational or related field, or by problem area) than by type of sponsorship (e.g., governmental vs. non-governmental).

** Hood (1973) in a exploratory investigation of the subject matter content of the domain of R&D training resources, demonstrated that content area counts for RIE, book titles, and instructional materials, were correlated ($r \geq .6$) and that rough estimates of quantities could be made for one form, given the content estimates for other forms. Paisley, Cirksena, and Butler (1979) demonstrate how subject matter content can be cross classified by special audience orientation to investigate information equity issues.

difficult, e.g., use of different types of indexing systems, inablity to establish correspondencer among terms in different indexing systems, absence of index terms that deal with areas of specific interest, costs of estimating content coverage for nonclassified or inappropriatedly classified collections. The current EDSSP indicators analyses have only briefly explored subject matter content due to these technical difficulties, later analyses should examine how well these findings, based on the entire subject content area, fit smaller subject matter partitions of various knowledge collections.

Structure. We noted that the formats in which knowledge appears can vary by form (oral, document, nondocument, references) and by level of formality (formal, semi-formal, informal). (See Figure 2.) The structure of the knowledge base is significantly related to our ability to develop satisfactory indicators. Generally, only the formal level of knowledge comes under adequate bibilographic control and is therefore available for analysis even if special efforts are made to conduct the analysis. Consequently we know very little about most oral forms or informal levels of knowledge. We know only slightly more about semi-formal levels of documentary forms, largely through the fact that RIE accesses a modest (but unknown and probably relatively small) portion of this type of documentation. Formal levels of nondocument materials (e.g., textbooks, audio-visual aids) are accessible, but usually are less conveniently or adequately referenced than document forms. In general, the major portion of our information about the educational knowledge base is derived from collections of formal level documents or instructional materials that are referenced by national information reference systems (e.g., RIE, CIJE, NICEM,* Education Index, Reader's Guide To Periodical Literature, Psychological Abstracts, Dissertation Abstracts, Current

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* National Information Center for Educational Media, University of Southern California.

Contents, Books in Print, etc.). This fact may mean that there are severe biases in our conception of the total knowledge base, since these well referenced, formal sources constitute no more than a few percent of the total volume of educational knowledge.

Organization, Basis and Sponsorship. Figure 3 reminds us that there are additional dimensions that may severely attenuate or bias our concept of the educational knowledge base. First, we tend to treat more highly organized forms of knowledge (e.g., products or programs) in ways that are conceptually and practically very different from less organized forms. (This point will be discussed further when we consider knowledge utilization indicators.) Second, we tend to place much greater emphasis on knowledge that has a more substantial R&D basis (usually by assuming that R&D-based knowledge is more trustworthy). Finally, sponsorship may affect the importance that is attached to, or the availability of data concerning the more organized forms of knowledge. Less organized forms of knowledge tend to be associated with the communities (e.g., scholarly disciplines, sub-fields of the education profession, or groups of practioners dealing with similar problems) that tend to produce and use those forms of knowledge. Because more organized forms require additional investments to achieve higher levels of organization, sponsorship may become an important factor that influences not only the production of knowledge, but its documentation, accession by abstracting and indexing systems, and its promotion and distribution to consumers.

Organization, basis, sponsorship, and subject matter content may all affect the composition of various collections or the scope of reference sources upon which our indicators are based. Our current indicators tend to be focused primarily on subject matter content in curriculum and instruction (including teaching and learning) at elementary and secondary levels, on governmentally sponsored R&D based knowledge, or commercially produced products, and pertains

almost exclusively to formal levels of documents or materials. If this is true, what portion of the total education knowledge base are we covering? How far can we generalize?

DISSEMINATION STRUCTURE DIMENSIONS

Dimensional Analysis of Educational Dissemination Structures and Functions

Educational knowledge, in its various formats, is communicated through a large variety of media and channels. The sources and channels that educational information users employ will be discussed in a subsequent section on utilization. In this section we are concerned with the more formal structures and arrangements that have been deliberately created to facilitate communication or to provide access to knowledge. Fortunately, there are several pertinent studies that have dealt directly with frameworks for analysis of this area. These studies suggest that there may be as many as ten dimensions that need to be considered in mapping the character of educational dissemination structures and functions.

Butler and Paisley (1975) have provided a general taxonomy for mapping educational dissemination structures in terms of six dimensions:

1. Level (of sponsorship of services)
   - National
   - Regional
   - State
   - Local

2. Base (institutional base or setting)
   - Government, Centralized
   - Government, Decentralized
   - Professional Association
   - University
   - Private, Non profit
   - Private, For profit
   - Consortium

3. Services Provided*
   - Information
     - Retrieval Services
     - Publication Services

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* Butler and Paisley (1975) identify 24 specific services within the four major service categories listed here.

- Instructional Materials (media services)
- Human Services (guidance, referral, consulting, technical assistance, etc.)
- Continuing Education

4. Focus of Services
   - General
   - Subject Specific
   - Product Specific
   - Audience Specific

5. Client Interface
   - Print
   - Media
   - Human

6. Source of Initiative (for undertaking services)
   - Client (demand services)
   - Staff (scheduled services)

The Butler and Paisley taxonomy was used to classify more than forty linkage models. Then Katter and Hull (1976) employed these dimensions in an intensive field survey of 53 information service sites throughout the United States. To guide sampling, the fourth and fifth Butler-Paisley dimensions (Focus of Service, Client Interface) were combined to form a new dimension:

- Main Orientation
  - Audience-(client-)oriented
  - Service-oriented
  - Collection-oriented
  - Product-oriented

Main orientation and Service area (national, state, regional, or local) were chosen as the two primary dimensions to select representative services. (The actual sample of 53 sites displayed significant variation along all six of the Butler-Paisley dimensions.) Because the Katter and Hull survey focused on educational information services defined as consisting of some form of education information collection(s) with a conduit or means of outside access (i.e., beyond the organization housing the service), types of educational dissemination structures where a collection of some sort is not a significant feature (e.g., teacher centers, school study councils, inservice training consortia) were

excluded. Despite this "collection bias," the Katter and Hull study results provide a corroborative demonstration of the general value of the Butler-Paisley taxonomy. The following conclusions from the Katter and Hull survey are illustrative:

> The activities represented by these information service sites did not display a few well standardized work-role patterns, but rather showed considerable diversity. The kinds of materials, artifacts, functions, and activities considered by these sites to be educational resources were numerous. Many sites performed a large proportion of all service activities, but the activity mixes were unique.
>
> There are important and consistent differences among collections that serve different functions, and neither leadership nor planning and policy factors can be safely generalized across different types.
>
> There are clearly distinguishable operating service orientations among sites; these have important ramifications for maintaining the overall basis for satisfying educational information user needs...
>
> The pattern of service request channels is different for print, nonprint, and machine-readable collections.
>
> Distinctions can be drawn between the different goal-oriented viewpoints that provide the initial impetus to the development of a collection, i.e., collection-oriented, audience-oriented, high-level decision, or program.

Four other types of measures are dealt with either directly or indirectly in Butler and Paisley (1975; 1978), Katter and Hull (1976), and Paisley, Blackwell, Emrick, Rittenhouse, and Cooper (1978). These are:

7. Inputs
   - Funding
   - Staffing
   - Knowledge resources
   - Technology resources
   - Other resources (e.g., in-kind contributions, special relationships with sponsors or clients)

8. Structures (missions, structures, functions, SOPs, etc.)
   - Organizational arrangements
   - Information processing/service structures
   - Communication structures
   - Other structures

9. Outputs (to clients)
   - Direct outputs
   - Indirect outputs (e.g., client outcomes)

10. Contexts
    - Intraorganizational
    - Interorganizational
    - Environmental (technical, social, political, economic, cultural, historical).

For our present analytical purposes, these ten dimensions may be sufficient to categorize educational dissemination services. However, there is already a substantial body of descriptive literature that points toward need for greater refinement of the human category of the Client Interface dimension (# 5 above), particularly in terms of the roles and functions of educational linking agents (Havelock, 1968; Sieber, Louis, and Metzger, 1972; Piele, 1975; Crandall, 1977; Culbertson, 1977; Lieberman, 1977; Moore, 1977; Butler and Paisley, 1978; Hood and Cates, 1978; Emrick and Peterson, 1978; Louis and Sieber, 1979). After reviewing these references, Cates (1978) identified and discussed 12 structural factors that appear to influence linking agent functions. These are:

- the linking agent's position within a project or program;
- the modal or generic role performed by the linking agent;
- the stage of the dissemination process in which the linking agent and clients are engaged;
- the location of the linking agent in relation to the client system (external versus internal);
- the time (full-time versus part-time) the linking agent can devote to the job (also the time the linking agent can afford to spend with each client);
- the experience (training and relevant work experience) of the linking agent;
- the maturity of the dissemination project;
- the maturity of the client;
- the scope, character, and maturity of the resource/support system;

- the context within which the linking process occurs;
- the roles and functions of significant others engaged in dissemination or educational improvement; and
- the type and degree of differentiation among content domains (e.g., technical skills, cognitive skills, personal attributes).

We doubt that as many as 12 structural factors may be needed to establish, at a practical level, the most important differences in linking agent functions; however, we do expect that further differentiation in the Client Interface Dimension (#5 above) will prove useful.

Implications for Development of Educational Dissemination Structural Indicators

The federal government has collected and reported statistics on public libraries and academic libraries for nearly 110 years, and for school libraries and media centers for nearly half that time. From the mid 1960's to the mid 1970's, the National Center for Educational Statistics (NCES) conducted separate surveys for elementary and secondary school libraries, college and university libraries, and public libraries. The Library General Information Survey (LIBGIS) was initiated in FY 1974. The series of LIBGIS surveys have included public libraries, public school libraries/media centers, college and university libraries, federal, state, and special libraries in federal and state governments and in commerce and industry. Data in these surveys included information on print and nonprint materials, expenditures, staffing, physical facilities, service activities, and hours of service.

Although the NCES data on libraries and media centers is extensive and is available for state and local levels (i.e., library systems in institutions of higher education, public libraries serving communities of 25,000 or more) these types of collections represent only part of the diverse set of educational information centers and services that exists. Butler and Paisley (1975), the NIE Databook (1976) and Katter and Hull (1976) provide sources of information

concerning the types, general numbers, collections, functions, clients, products and services, staffing and organization of a variety of nonlibrary information centers and services. Qualitatively, we know a great deal about the general types of educational information centers and services. But current, comprehensive, nationwide survey data does not exist for nonlibrary collections or systems. Consequently we know most about the more traditional, collection-oriented, archival systems and least about the newer, client-oriented centers and services.*

* Some libraries have moved significantly toward a greater client and service orientation, but our data systems tend to be blind to providing any kind of information that could be used to indicate these trends.

KNOWLEDGE UTILIZATION DIMENSIONS

Dimensional Analysis of the Educational Knowledge Utilization Area

Analysis of the educational knowledge utilization area tends to be difficult for two reasons. First, it is an area that has not received much close examination until the last decade. Second, there are several different fields of inquiry that have tended to develop distinctly different perspectives on educational knowledge utilization. In terms of organized conceptual and methodological approaches that are accompanied by empirical data, the four most prominant fields of inquiry are:

1. Communication and knowledge utilization by educational researchers.
2. Communication and knowledge utilization by educational practitioners, administrative, and governance groups.
3. Planned change or problem solving.
4. Marketing/adoption of products/programs.

Each of these fields tends to view the educational knowledge base quite differently. In terms of the kinds of knowledge depicted in Figure 3, page 17, the first knowledge utilization field listed above, communication and use by educational researchers, is concerned primarily with just the upper right hand section of Figure 3, labeled "Research-Based Knowledge." The second knowledge utilization field, communication and use by practitioners and others, is in fact, concerned with the entire knowledge base, i.e., all of Figure 3. The planned change or problem-solving field may also encompass the entirety of Figure 3, but it tends to focus primarily on the middle column of Figure 3, i.e., on validated programs, promising practices and general practice. The fourth field, marketing /adoption of products or programs, tends to focus primarily on the upper left hand quadrant of Figure 3, i.e., on R&D Products,

the more successful non-R&D products, and on the more tangible types of validated programs or promising practices.

These fields of inquiry also differ in their view of the social unit that is considered as the "user." The first two focus primarily on individuals, either researchers or others, who search for, acquire, and apply knowledge to meet their own needs or who pass the knowledge along "as is" or transformed in some way to others. The last two fields of inquiry may also focus on individuals, but more likely they will focus on groups or organizations, or their representatives. However, there is one profound difference between these last two in the data they provide about "users." The planned change or problem-solving perspective usually focuses on a specific user (individual, group or organization); while the marketing/adoption perspective is almost always concerned with aggregate data concerning classes of users rather than with specific users.

Because of these differences in focus on different aspects of the educational knowledge base and in conceptions of the "user," each field has developed its own conceptions and data regarding knowledge utilization. These are summarized briefly below. The communication and utilization studies of researchers and of practitioners are described more completely in Appendices A and B.

Communication and knowledge utilization by educational researchers. This field of study derives its concepts and methodologies from a substantial body of research on scientific communication and from studies of information needs and use in areas such as science, engineering and psychology. Studies in education have focused almost exclusively on active researchers (not development, dissemination or evaluation personnel) who publish or attend national meetings. Substantial data exist that describe the formal and informal search for, use, and exchange of information in connection with the various stages of a research project, presentation at national meetings, and publication in professional

journals. In general, the image that emerges is that the scientific communication system in educational research does not differ greatly from other disciplines, but that it does seem to involve much more random information exchange, less frequent informal communication among researchers in the same research area, longer delays in reporting and referencing reports, greater dispersion in journal focus, and less evidence of search for previous research results during project planning phases. The image of utilization is closely associated with the stages of a research project. (See Appendix A.)

Communication and knowledge utilization by practitioners, administrative, and governance groups. This field of study has derived its concepts and methodologies from user needs studies in library and information science. Because practitioners' and others' needs for information are often not associated with anything as well defined as "projects" and may never result in formal presentations or publications, many of the methods used to study communication and knowledge utilization among educational researchers cannot be used. Typically, one of two study approaches is employed. Clients or subscribers of specific services are studied, or, alternately, random samples of defined user groups are studied. The two types of studies tend to produce markedly different findings that may be characterized most succinctly as findings concerning "users" and "non-users."

The general image that emerges from over a dozen major surveys is that practitioners and other educational information users require relatively small amounts of information from a large, highly diverse body of information. Most users have seriously restricted time for gathering and using the information. Moreover, the organizational, social, and cultural systems provide them with few rewards for highly systematic search and use; hence motivation for seeking and use is often low. Generally, the local, easily accessible, and typically

personal sources are used in preference to more distant, inaccessible or formal sources. Within a general pattern of use of different sources, there are significant differences according to the individual's position or role. However, individuals with manifestly different work activities, requiring different types of information, and with markedly different preferences for types of information sources, display remarkable similarities in the reasons they give for their preferences for different sources. Regardless of the source preferred, most are likely to turn to this source because it is: 1) likely to have the wanted information, 2) near at hand or accessible, 3) responsive to the individual's problem or question, 4) easy to use, and 5) usually available when needed.

Among different user positions there are significant differences in need for information for different purposes, thus confirming the obvious assumption that different types of users (e.g., teachers, administrators, school board members) would have different purposes for seeking information. Factor analysis indicates that there are perhaps as many as eight very general clusters of purposes for seeking educational information. These are: 1) to improve one's own work by keeping aware of what others are doing, 2) to identify new sources of assistance or new competencies, 3) to evaluate or make specific decisions about educational practices or products, 4) to make or set educational policy, 5) to find answers, support decisions, or develop alternatives, 6) to support scholarship (e.g., to gain theoretical information or to prepare formal reports), 7) to teach and maintain instructional competence, and 8) to provide information to others. Several of these clusters of purposes for seeking information touch on educational improvement, but from a variety of directions.

Despite significant differences among practitioners and others in their need for information for different purposes, a strong general pattern tends to

characterize most user groups. Overall, the purpose which shows the greatest need for information is keeping aware of developments and activities in education, the second most important need is for information to find specific answers to questions in relation to the individual's own work. Identifying new sources of assistance for improving one's own work and developing alternative approaches to solving problems are also high needs.

Aside from general information about frequency of use of different sources or user's ratings of importance of information for different purposes, there is relatively little information concerning actual use or benefit. When specific services are traced for benefit or impact the results are sometimes diffuse. In one classical evaluation of an information service approximately 60 percent of a group of over 600 clients could identify no specific use and few other benefits derived from the service. However, when one focuses on critical incidents of information use involving any source, rather than one specific source or service, a decidely different picture emerges. For instance, one nationwide survey of many different types of information users indicates that virtually all those interviewed were heavily engaged in responding to requests for information and spent substantial amounts of their time responding to such requests. This study suggests that the information requester may not be, and most probably is not, the ultimate end user.

Further confounding the issue of impact assessment especially when it is confined to specific sources or services, are two facts. First, most practitioners tend to search more than one source when seeking information that they really need, and, in complex applications, often report that several types or sources of information were influential or applicable to the use they report. Consequently association of a specific source with a specific use/benefit is difficult. Second, users tend to employ different types of sources for different

purposes. Hence studies that focus on users of specific types of services may derive highly biased impressions of the impact of knowledge utilization. For example, users who prepare classroom materials and are alert to new ideas, sources or methods tend to make greater use of information centers, libraries, text and reference books, journals, abstracts and indexes. In short, these types of users tend to use the types of knowledge (base) formats that come under bibliographic control and that are most easily indexed by existing knowledge base or formal dissemination system indicators. By contrast, those who seek information to set policy or support decisions tend to use face-to-face communication, the telephone or correspondence in preference to more formal sources. Since the use of these informal media is rarely studied in education, it is easy to miss many policy applications.

The image of knowledge utilization by practitioners is thus a fuzzy one. Knowledge is used for very many different purposes. Most of the information is locally based and informal in character. When individuals do search beyond personal and local sources for information they really need, they tend to use more than one source. Aside from instructional staff, who do tend to use libraries and bibliographic sources, most individuals rely heavily on information that is provided by others. Hence, if there ever was a formal source, it may be several steps removed from the ultimate user of the information. Multiple purposes, multiple sources, and the chain of human intermediaries confound efforts to gauge knowledge impact. But perhaps the most profound problem lies in our limited conceptions of knowledge utilization. Most knowledge utilization in education is not clearly associated with "problem solving" or "decision making" or "planned change," except perhaps at the microscopic level of day-to-day work activities. Much knowledge is used to keep aware of developments and activities in education, to find answers to specific questions arising in relation

to work, to locate information to provide to others, and to identify new ideas, methods, or procedures. "Coping" and "improvement" are major themes in the reasons that practitioners give for seeking information, but the effect of knowledge utilization tends to be so multi-faceted, subtle and incremental, that much of its impact and benefit is often missed or ignored.

However, when we move to the "macro" level of knowledge utilization, and especially when we deal with more organized forms of knowledge and its utilization we encounter decidely more structured images. These are described in the following sections.

The planned change and problem-solving perspective. In the field of education this perspective has been popularized by Havelock (1969) under the label Problem Solver (PS) perspective. In this perspective, the user initiates the process of change by identifying an area of concern or by sensing a need for change. Once the problem area is identified, the user may attempt to alter the situation either by him/herself or by seeking outside assistance. Lewin (1952) identified three major stages: Unfreezing, Moving, and Freezing. Each major stage involves a sequence of activities, e.g., the moving stage involves the formation of an action idea, including "reconnaisance" of goals and means, this leads to the formulation of a general plan, and then a sequence of action steps, each involving examination of results and making decisions concerning subsequent steps.

Fifteen years after Lewin's formulation, Miles and Lake (1967) described a strategy for planning self renewal in schools that involved the following explicit stages: 1) clarify expectations about program, 2) collect information, 3) formulate goals, 4a) problem sensing, 4b) diagnosing, 4c) set change target and objectives, 4d) locate or invent solutions, 4e) weigh cost and gain, 4f) decide on alternatives 4g) plan to implement, 5) carry out plans,

6) institutionalize the self-renewal process, 7) phase out external assistance, 8) assess continuing activity, 9) feedback to participants, and 10) disseminate to others. Havelock (1969, p. 10-56) compares the planned change phases that have been identified by ten authors. There are substantial similarities with some important differences. The Miles and Lake formulation appears to be one of the most comprehensive in scope and in the detail of its articulation.

Havelock (1969), Sashkin, et al. (1973) Glaser, et al. (1976), Zaltman, Florio, and Sikorski (1977), and Hood and Cates (1978) provide succinct summaries of various planned change and problem-solving models. Although there are many differences among these models, they all tend to represent specialized forms of knowledge utilization in which knowledge is employed in highly organized ways, and often with external technical assistance, to initiate, facilitate, or support major problem-solving or planned change efforts in individuals, groups or organizations. These efforts may range from short-term attempts to deal with specific problems to long-term efforts to change entire organizations or institutions. Because different social levels (e.g., individual, group, sub-unit, organization) may be the target of the change effort, and because different time frames and change strategies are employed, there is a bewildering variety of methods and models. However, all these approaches share a common focus in concentrating on the conditions, problems and needs of specific clients (individuals, groups or organizations). Both internal and external sources of knowledge are employed. Each model tends to view the knowledge utilization process in terms of a progression of utilization stages that may be idealized as linear, but in practice are found to occur simultaneously or overlapping one another, often in different sequences from that prescribed by the idealized model, and often in cyclical or nested patterns.

Marketing/adoption of products or programs. While the planned change and problem-solving perspectives focus primarily on specific clients and may employ a wide variety of forms of knowledge, the marketing/adoption perspectives tend to focus on a specific product, program or innovation, and tend to treat potential users of these organized forms of knowledge as classes or aggregates rather than as specific clients.

Three conceptions are commonly encountered. These are: 1) the Marketing Model, 2) the Social Interaction Diffusion (SID) Model, and 3) the Concerns-Based Adoption Model (CBAM). Utilization of educational products and the more tangible types of educational programs is often considered within a marketing framework. However, as educational products become more complex, intangible, and interactive, they shade into the second column depicted in Figure 3 (p.17). Here we encounter educational programs and practices that may or may not contain products. Although a marketing perspective may still be applied, the Social Interaction Diffusion or the Concerns-Based Adoption Models are more frequently employed. All three models tend to focus on a particular, externally developed innovation or class of innovations (e.g., particular educational materials, programs, processes or structural arrangements), and tend to be concerned with individual decision makers. The Marketing and the Social Interaction-Diffusion Models focus primarily on aggregates of individual decision makers (e.g., market segments, potential adopters, early adopters); the CBAM perspective also focuses on individuals, but within the context of adopting organizations.

Marketing Model. Utilization of tangible educational products is now frequently considered within a marketing framework (e.g., Hood, 1970; Sikorski and Hutchins, 1974; Kotler, Calder, Sternthan, and Tybout, 1977). Fundamental to the marketing approach is the definition and analysis of the needs of potential users as a basis for product development and dissemination. Application

of the approach usually, but not always, assumes the existence of a sufficiently large number of consumers to justify a high initial development and distribution cost. On the basis of market research pertaining to user behavior, homogeneous (segmented) markets are identified and specific products, price, channel, and promotional strategies are developed to satisfy the needs of particular market segments. Product utilization indicators may include measures of: product awareness, disposition toward the product (e.g, attitude toward, intention to adopt), trial, adoption, implementation and initial use, and continuation (e.g., brand loyalty, product switching). The use and interpretation of these indicators are significantly conditioned by the product's life cycle, e.g., when a product is initially disseminated, the focus may be on measures of consumer awareness, favorable disposition, intention to try the product. In later stages, rate of adoption and share of the market may become key indicators. In some cases efforts may be made to measure user satisfaction or user perceptions of costs and benefits.

The social interaction diffusion (SID) perspective has its roots in anthropological studies of the diffusion of cultural traits and in sociological studies of the diffusion of innovations (Rogers, 1962; Robertson, 1971, Zaltman and Brooker, 1971; Rogers and Shoemaker, 1971). In contrast to the product marketing perspective the SID pespective is markedly more sensitive to the complex and intricate set of human relationships, societal and organizational substructures, and communication processes involved in the dissemination and early utilization phases. The various versions of the SID perspective tend to identify a similar series of stages (Zaltman, Florio, and Sikorski, 1977). The initial impetus for change in individuals comes from awareness, perception, or recognition of a problem. A knowledge or information stage follows in which there is deliberate search for or accidental exposure to relevant information

that helps to define the problem and relate it to one or more potential solutions. If enough interest is generated, the individual seeks more information that leads to comprehension and further understanding of the innovation and to formation of attitudes, including a mental evaluation in terms of the individual's own search criteria. If the innovation meets these criteria, at least at a satisficing level, a trial stage may be entered in which the individual actually tries to use the innovation on a provisional basis. Following the trial, an adoption or rejection decision is made.* (Missing in most of these models, but evident in the CBAM perspective is attention to later stages following the decision to adopt.) Although this description suggests a linear series of stages, descriptions of actual individual behavior suggest that various stages may occur simultaneously, in different sequences, and sometimes with cyclical feedback and feedforward loops.

The Concerns-Based Adoption Model (CBAM) is a direct outgrowth, but significant extension of the social interaction diffusion perspective. (Hall, et al., 1973, 1974). CBAM explicitly considers: (a) how various participants in the same adoption activity may respond at various stages, (b) identifies several stages subsequent to the decision to adopt, (c) operationalizes the identification of each utilization stage (levels of use) for individual users and (d) identifies the concomitant user concerns. The basic hypothesis of CBAM is that the key to facilitating adoption of a change is guiding the client through various stages of concerns that are associated with different levels of use. The CBAM recognizes eight "levels of use," that are defined as "distinct states that represent observably different types of behavior and patterns of innovation use

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* Later versions of the SID perspective include a dissonance reduction, confirmation, or resolution stage in which the user seeks information to confirm the correctness of the decision.

as exhibited by individuals and groups. These levels characterize a user's development in acquiring new skills and varying use of the innovation. Each level encompasses a range of behaviors, but is limited by a set of identifiable decision points. The levels of use and their demarking decision points are displayed in Figure 4.

Associated with each level of use (LOU) in CBAM are seven categories that serve to identify more precisely the LOU the user occupies in terms of: 1) knowledge the user possesses about the innovation, 2) information acquisition activity, 3) information sharing activity, 4) assessment activity, 5) planning activity, 6) status reporting activity, and 7) performance actions and activities in operationalizing the innovation.

We note that the SID and CBAM conceptions are complementary. SID tends to emphasize the diffusion processes and the utilization stages prior to the decision to adopt while CBAM tends to emphasize the implementation stages following the decision to adopt. Taken together SID and CBAM provide an elaborate, empirically-based conception of how more complex educational innovations are disseminated and used.

Implications for Educational Knowledge Utilization Indicators

In the previous sections we have reviewed four major fields of inquiry that have strongly influenced various conceptions of educational knowledge utilization. Each field is prone to its own kind of bias. The studies of communication and knowledge utilization by researchers are prone to focus primarily on R&D-based, formal levels of knowledge, to emphasize the more formal, discipline based communication systems, and to view utilization as occuring within the context of an R&D project. Although it is obvious that this study area covers only a very small portion of the total educational knowledge base

FIGURE 4

CONCERNS-BASED ADOPTION MODEL

DECISION POINTS	LEVELS OF USE
	0. NON-USE: State in which the user has little or no knowledge of the innovation and no involvement.
A. Takes action to learn about the innovation.	
	I. ORIENTATION: The user has acquired or is acquiring information about the innovation or has explored or is exploring its value orientation and its demands upon user and user system.
B. Makes a decision to use the innovation by establishing a time to begin.	
	II. PREPARATION: The user is preparing to first use the innovation.
C. Begins first use of the innovation.	
	III. MECHANICAL USE: User focuses most effort on the short-term, day-to-day use of the innovation with little time for reflection. Changes in use are made more to meet user needs than client [beneficiary] needs. The user is primarily engaged in a stepwise attempt to master the tasks required to use the innovation, often resulting in a disjointed and superficial use.
D1. A routine pattern is established.	
	IVa. ROUTINE: Use of the innovation is stabilized. Few if any changes are being made in ongoing use. Little preparation or thought is given to improving innovation use or its consequences.
D2. Changes use of the innovation based on formal or informal evaluation in order to increase client outcomes.	
	IVb. REFINEMENT: The user varies the use of the innovation to increase the impact on clients within immediate sphere of influence. Variations are based on knowledge of both short- and long-term consequences for clients.
E. Indicates changes in use of innovation based on input and coordination with what colleagues are doing.	
	V. INTEGRATION: The user is combining own efforts to use the innovation with related activities of colleagues to achieve a collective impact on clients within the common/ sphere of influence.
F. Begins exploring alternatives or major modifications of the innovation presently in use.	
	VI. RENEWAL: The user evaluates the quality of use of the innovation; seeks major modifications of or alternatives to present innovations to achieve increased impact on clients; examines new development in the field and explores new possiblities for self and the system.

and possibly an even smaller portion of educational knowledge utilization contexts and environments, we suspect that the "R&D" conceptions of knowledge utilization may exercise a subtle and largely unwarranted influence on our conceptions of educational practitioner knowledge utilization. We think this kind of influence may exist because these studies of communication and use in R&D settings help to describe, sometimes in great detail, what research (and perhaps development and evaluation) personnel do. It is then all to easy for researchers to generalize either normatively or prescriptively, to educational practitioners.*

The educational marketing/adoption studies involve a different kind of bias. Unlike the R&D communication and utilization studies, these studies do deal with practitioners as "consumers" or "adopters." However, the problem here is the narrow focus on only that part of the knowledge base that has been "organized" in product or program form, and on practitioner utilization situations where a product or program is "the answer." The conceptual apparatus of the "communication and adoption of innovations" literature has become so powerful that the four-part DAG definition of dissemination includes "choice" and "implementation" as the two dissemination levels that should naturally follow "spread" and "exchange" (DAG, 1977).

We consider the planned change and problem solving field of inquiry as one that is relatively much less biased in its conception of knowledge utilization, since this approach may embrace much of the entire educational knowledge base, and because it tends to address many significant aspects of educational practice improvement. Unfortunately much of the literature in this field has tended to be prescriptive or, if descriptive, has tended to describe only the major

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* Paisley (1971) explains how confusion between research disciplines and practitioner fields has led to the selection or design of inappropriate information systems in education.

events and conditions concerning knowledge search, processing, and application. Details about exactly how all pertinent knowledge was acquired and used are usually lacking. One consequence is that conceptions of the communication/dissemination system are often limited and usually tend to emphasize the particular external or internal linkages that were established or facilitated by the activities of the change agent or consultant.

The studies of information needs and use by educational practitioners can serve as an important complement to the planned change and problem solving inquiries, since the information needs studies have the potential capability of encompassing all of the educational knowledge base and all aspects of educational knowledge utilization. The existing studies in this field of inquiry provide strong evidence that most educational knowledge utilization is not concerned with adoptions, planned change or major types of problem solving. The major defects of most educational practioner information needs and use studies are that they nearly always focus on individuals, and tend to cover a broad range of information areas at relatively superficial levels. Currently available data fail to provide details about exactly how information is acquired and used and do not provide much information about the organizational, group, social, or work contexts in which the information is used. Perhaps the most important direction that this particular field of inquiry could take would be to pursue in much greater detail the various major contexts and purposes for which knowledge is sought and used. For example, what is the role and impact of knowledge in formulation and development of educational policy at any level of education? What are the sources and uses of knowledge in developing or improving in-service training programs?

It should be obvious that all four fields of inquiry can be complementary. However, our major concern has been to point to the dangers and biases of viewing

ing educational knowledge utilization from any one of these perspectives. All of them are seriously incomplete in some way.

How can we dimensionalize the field of educational knowledge utilization if there is no comprehensive conceptual framework? Review of the literature indicates that a very large number of dimensions may prove useful, depending on the focus or the level of detail of the analysis. The following discussion will be organized around six major categories or dimensions:

- Resource Type (knowledge input)
- User Type
- Purpose
- Scale, Scope, and Complexity
- Strategy, Tactics, and Complexity
- Method of Inquiry.

Resource type. In the previous sections on the dimensional analyses of the knowledge base and of the dissemination system, we considered a number of dimensions that may have a relatively direct bearing on utilization, e.g., level of formality, format, type or degree of "organization" of knowledge (products, programs, ideas), type of information service interface (print, human). The characteristics of how knowledge is organized and how it is communicated need to be considered in a conceptual "mapping" of educational knowledge utilization. In the immediately preceeding sections we have suggested some ways in which various fields of inquiry tend to emphasize or ignore different types of knowledge and different types of dissemination systems. When conceptions of education knowledge utilization are thus constrained or limited, they obviously can tell us only part of the total educational knowledge utilization story. We need to know what and how well different areas are covered; conversely, we need to know where we have little or no information.

User types. We also need to differentiate among different types of users. Previous research has amply demonstrated that there are many differences among users of educational knowledge that may profoundly affect their needs for information, the methods they employ in searching for information, the sources they commonly rely on, the types of uses they make of the knowledge they obtain, and so on. Organizational, situational, and personal factors may be important. The type of organization (e.g., state education agency, R&D center, intermediate unit, local school), its location, and the information environment of the organization are usually important. Situational factors may include: the position and role of the user (individual or group), the general nature of the work performed, the work setting, the reward/control systems, the supervisory, peer, and aide information use community, and the character and proximity or accessibility of information resources. Personal factors may include the: discipline or profession of the user, level of training, experience with use of information or other knowledge sources, status, stage of career, capabilities, work styles, information search and use styles, personality, and role in information transmission networks (e.g., gatekeeper, liaison, receiver, isolate). Depending on the level of detail of analysis some, perhaps most, of these user typing variables may be important. Type of organization, type and level of position (or group or organizational unit), and type of task will nearly always be important factors that significantly affect knowledge utilization.

Purpose. Organizational, situational, and personal factors all tend to influence the specific purposes or uses to which knowledge is applied. However, because this complex dimension is so powerful in predicting or explaining knowledge utilization behavior, we single it out for special consideration. On pp 32-33 and in Appendix A and B we have presented some evidence of the general effect of purposes on the need for or use of information. General functional areas

e.g., policy making, governance, administration, instruction, research and evaluation) and their various functional subareas tend to be the first or most powerful subdimension for organizing purposes. These functional areas are (roughly) crossed by general types of information use stages or phases (e.g., maintaining current awareness, browsing, developing background or orientation, comprehensive or selective search, retrieval of specific data, facts, ideas; etc.) and by types of outputs (e.g., informing others by alerting, answering, referring, teaching, advising; responding, reacting, or reporting to others; promoting or opposing ideas, positions, proposals or projects by proposing, defending, reinforcing, detracting; development of analyses, plans, procedures, guidelines, instructions, appraisals, etc). This complex of functional areas, use phases and outputs tend to characterize or define the information use task or activity. Associated with these information use tasks or activities are specific requirements, relating to information needs or information outputs, such as: urgency of the requirement, scope and level detail, specificity, relevance, accuracy, comprehensiveness, currentness, reliability, authority or credibility of the source, difficulty level or intelligibility, "entitlement,"* character, trustworthiness or proven capability of human resources.

Scale, Scope, and Complexity. This area relates to the scale of effort and the scope and complexity of action or impact that may be involved. We have previously noted that most knowledge utilization in the field of education seems to be associated with the day-to-day work activities of individuals, but that substantial amounts of the information that is acquired by one person may be passed on in some form to others. Even when we examine the planned change or problem solving literature in the field education, we discover that

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* See Butler and Paisley (1978, pages 31 and 32).

much of it is focused on the individual or on small groups. But we do find examples of efforts to accomplish planned change at other social/organizational levels, such as the department, school building, local district, community levels, and in interorganizational relationships and structures. It is important to know which level(s) may be designated as the primary (and secondary) clients/users of information or technical assistance products or services or targets of change efforts. At any particular level the numbers of clients, or beneficiary persons, groups or units, may vary greatly, as may the structure and complexity of their relationships or interdependecies as social or organizational systems. Other aspects of scope may include the size, duration, comprehensiveness and continuity of the knowledge utilization activity, and its relationship, "interface," or coupling with units, work flows, related functions, or projects.

Strategy, tactics, and methods. Scope, scale, and complexity have another aspect that is related to the type, quality, and magnitude of knowledge resources, and the frequency, duration and intensity of knowledge "inputs" that are available and that can be applied or maintained in a particular utilization. Generally, scope and scale of inputs will be related to scope and scale of application situations and of outcomes. A highly important but sometimes ignored aspect of scope, scale, and complexity relates to the specific strategies, tactics, or methods that may be employed, i.e., the targeting, timing, orchestration, and concentration (or diffuseness) of the utilization effort. The details relating to who, where, when, what, how, how much, and what perceived intents or effects are sometimes critical aspects for the analysis of any information utilization situation of even modest scale, scope, or complexity. Hood and Cates (1978), Zaltman, Florio, and Sikorski (1977), and Glaser, et al (1976) are convenient recent sources that provide orientations to the extensive literature on knowledge utilization strategies, tactics, and methods.

Methods of inquiry concerning knowledge utilization. This last area is not so much a set of dimensions for conceptualizing knowledge utilization as it a set of dimensions for considering the methods or approaches for obtaining information about educational knowledge utilization.

Disciplinary paradigms. We have previously discussed the character of several of the dominant fields of inquiry regarding educational knowledge utilization. Lurking behind these fields of inquiry are several more fundamental aspects of inquiry. Perhaps most basic are the various disciplinary orientations that investigators may employ (e.g., human factors, social psychological, industrial-organizational, sociological, political science, information science). Each of these disciplines is generally characterized by a dominant paradigm that strongly influences the choice of units of analysis and variables considered, and the assumptions that are made about the role of work setting, tasks, individuals, groups, organizations and environments. For example, the human factors investigator generally selects the information processing task as the unit of analysis and may select measures of performance efficiency as the dependent variable. A social psychologist will generally select groups or individuals in groups as the unit of analysis, and may focus on attitudes, perceptions, behavior, or cognitive test scores as dependent variables. The industrial-organizational scientist will tend to use individuals as the unit of analysis and will tend to select communication or information use behavior or other performance measures as dependent variables. Sociologists may use groups or organizations as the unit of analysis, and may employ either individual variables aggregated to group or organizational levels, such as information source use rates or proportion of adopters, or they may employ group-level or organizational-level variables, such as measures of group heterogeneity or cohesion or structural change in an organization, as dependent variables. Each disciplinary paradigm also tends

to ignore some aspects that may be considered of substantial importance to other paradigms. For example, the sociological paradigm tends to ignore individual differences that may be considered to be of great importance to the social psychological or industrial-organizational paradigms. Information processing task characteristics are highly important in the human factors and information sciences paradigms, but may be largely ignored in social psychological and sociological paradigms. Because these paradigms strongly influence the nature of theory, the choice of variables, the methods of sampling and measurement, and the units and methods of analysis, they act as powerful perceptual and conceptual filters by limiting how we perceive and interpret knowledge utilization processes and by reinforcing the particular research or action perspectives that are employed.

Conclusion-oriented vs. decision-oriented inquiry. Disciplinary paradigms are associated primarily with conclusion-oriented disciplined inquiry (Cronbach and Suppes, 1969) or with what may be labelled as basic research or fundamental research. Cronbach and Suppes have introduced the concept of decision-oriented "disciplined" inquiry, to cover a range of more applied forms of inquiry including applied research, operations research, market research, and evaluation. Much of the empirical work on educational knowledge utilization is derived from these decision-oriented forms of inquiry, rather than from highly disciplined forms of conclusion-oriented inquiry. In many cases, this decision-oriented inquiry has adopted, explicity or implicitly, the perspectives and perhaps even the complete paradigms of one or more disciplines, but in other cases it is not clear that any particular paradigm has guided the inquiry. This lack of a coherent framework or paradigm makes it even harder to integrate the results of many studies of educational knowledge utilization.

Approaches for development of educational knowledge utilization indicators. Identification and recognition of the various forms of inquiry, along with analysis and evaluation of the biases, strengths, and weaknesses that are inherent in each can help greatly to make sense out of the mass (or mess) of available data that might serve as knowledge utilization indicators. Unfortunately, when our interests are directed toward identifying or developing knowledge utilizations indicators that can be associated with units to be aggregated to local, state, or regional levels, we quickly discover that there are very few reliable indicators of any kind that are available or that can be easily created.

Methodologically, there are three general approaches to collecting utilization data. These are: 1) start from the point of distribution (distributor-down), 2) start with the ultimate user (user-up) or 3) start in the middle by tracing channels or mapping the flow of messages, products or services. Each approach has its own set of advantages and disadvantages.

Distributor-down approaches. This type of approach is often used to assess usage or impact of particular products, programs, or services. Sales or service records may be obtained from distributors (e.g., the ERIC Document and Reproduction Service, a Regional Laboratory, a commercial publisher, an education information center) to ascertain volume of sales or services, geographic distribution, type of user, and perhaps other information about how the product, program, or service is being used. Among the problems encountered by this approach are: 1) inability to get the needed data from most distributors and 2) the fact that a request or purchase does not necessarily indicate actual use since a product or service may be used by several clients or may be purchased or requested and never used. Intensive follow-up studies of randomly selected samples of clients/purchasers/adopters can develop useful information about actual use and

perhaps even about client perceptions of benefits; however the first problem is not so easily solved. Many, perhaps most, distributors of educational knowledge simply do not keep the kinds of records that are required to identify users, except occasionally by address. Even in these instances, extensive manual search of records at the distributors' offices is often required. One especially disquieting aspect of record keeping is that the quality of product/service records is highly correlated with the kinds of products/services that are provided. Butler and Paisley (1975), in site visits to 26 diverse educational linkage programs found that those linkage programs that emphasized information retrieval or publication services tended to keep extensive files on services provided, number of publication units sent out, etc. However, programs that emphasized informal, interpersonal contacts (e.g., between the staff of a teacher center and its drop-in clientele) tended to be skeptical of the value of such record keeping and tended to evaluate their operations impressionistically on the basis of encounters with individual clients.

Our conclusion is that distributor-down approaches are workable if one is willing, a) to do substantial follow-up work tracing and contacting samples where adequate records can be found and, b) to recognize that the types of products, programs, or services that are being traced for utilization data may be peculiar and perhaps even highly biased samples of the more general classes of products, programs or services.

User-up approaches. Utilization studies that start with carefully selected samples of the ultimate user are able to overcome may of the problems inherent in top-down approaches. However, there are respondent sampling problems, e.g., should we include district level personnel (e.g., curriculum coordinators) building level personnel (e.g., principals, counselors or librarians), or classroom personnel (e.g., teachers or instructional aides), or some combinations?

How many of each type will be needed to develop acceptable precision at the selected level(s) of aggregation (e.g., regional, state, local)?

There are several other problems that may make the bottom-up approach difficult. These include: 1) the high expense of collecting sufficient data to provide reliable estimates for lower levels of aggregation (e.g., state or local levels), 2) the problems (and expenses) of overcoming non-response biases,* 3) the problems of obtaining data clearance at federal, state, and even local levels, 4) the very general problem that many ultimate users may not know very much about the original sources of the knowledge they use or even about significant intermediaries in a communication chain. This last situation may seriously limit how far "up," or how reliably one may be able to trace the relation between knowledge source(s) and ultimate users. When the ultimate user relies heavily on personal contacts or is exposed to many relevant information sources "backtracking" can be difficult or even misleading. Moreover, in situations where one's attention is in fact directed to the assessment of the user of specific types of knowledge or specific knowledge services, this approach may be highly inefficient, since typically, only a small fraction of any general type of information audience may be exposed to (and also aware of the message and source of) a particular communication. Despite these difficulties, the user-up approach enjoys, at least potentially, the distinct advantage of dealing with users in their work and information environment contexts. One is thus less prone to find or believe that one source or service is sufficient to meet the user's needs or to account for attributed benefits.

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* Without aggressive and systematic follow-up, mail surveys of educational practitioners may achieve only a 50 to 60 percent response rate. Field surveys attain substantially higher rates but at markedly increased costs per respondent.

Start-in-the-middle approaches. Rather than focusing on specific distributors who happen to keep satisfactory records or on ultimate users who may not know very well where their knowledge came from, one can focus on dissemination chanels in an effort to map the flow of knowledge through a chain of senders and receivers, e.g., by interviewing intermediaries such as linking agents, change agents, or consultants, who know what products, practices, or programs are in use, where they originated or were obtained, to whom they were passed, how they are used, etc. The problems with this approach are that: 1) it is subject knowledge-base, client-type, and response biases, 2) it requires substantial "triangulation" among different intermediary sources to cover the various major channels that may be conduits for particular user groups and for particular purpose/problem areas, 3) it requires substantial data interpretation, and 4) for the above reasons, it tends to be very expensive unless confined to limited dissemination and utilization domains (e.g., specific types of intermediaries, types of subject matter content or user problems, types of users).

Mixed approaches. Because there are problems with each of the above approaches, it seems likley that a knowledge utilization assessment that combines aspects of two or all three of the above approaches may prove to be superior to any one type of approach. For instance one might start with a survey of ultimate users to identify the major types of intermediaries that seem to be relevant for specific clients and specific types of knowledge utilization contexts (e.g., problems, purposes), and then proceed to a survey of these identified types of intermediaries who could provide further information concerning their own knowledge sources, their clients, their competitors, etc. Both users and intermediaries could be querried concerning applications, perceived impact and benefits, etc. Where more detailed information was required concerning the history, context, or impact of knowledge use, one could use the data from users

and intermediaries to identify and select specific use situations for more intensive case study. If these cases were selected randomly, projections to defined user populations would be warranted.

The current reality. Currently most of our information about knowledge utilization is extremely limited. There is a massive amount of annecdotal and case study information, but little of this information can be used to assess systematically how any form of knowledge is used on a nationwide, regionwide, or even statewide basis. We can identify, in some cases, the users or subscribers of particular information publications or services. Occasionally these publishers or service agencies have conducted surveys of their subscribers or clients. Moreover, in a few instances, such as the Evaluation of the National Diffusion Network (Emrick, Peterson, and Agarwala-Rogers, 1977) we are able to identify numbers and kinds of adopters by state and region. All of these information sources depend on distributor-down approach and are focused on one or more of limited classes of products, programs or services.

As we have noted, surveys of users provide an alternate point of entry for assessing utilization. To our knowledge, no nationwide probability sampling survey has been conducted that reported on utilization by any geographic basis.*

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* Most educational information use surveys have classified users by type of agency, position, or role. Due to costs involved in sampling and in securing clearances from educational officials in each state, many user surveys have sampled states and then subsampled agencies and persons in selected states. Due to failure to sample all states and/or lack of sufficiently large samples to afford reliable estimates at state levels or local levels of aggregation, data analyses at these levels are rarely undertaken. The Education Market Study (Hood and Blackwell, 1976, Vol. I, p. IV-56) did consider geographic region as a predictor of use of several types of information sources. When other key predictor variables were held constant, geographic location failed to add significant incremental prediction. Consequently, the effect of geographic location was not pursued further in this study. However, these data could be reanalyzed to develop crude state-level aggregates regarding practitioner information use for most, but not all states.

Many studies of educational knowledge intermediaries exist, e.g., Butler and Paisley (1975) on education linkage programs; Katter and Hull (1976) on education information services; Madey, Mojowski, and Strang (1977) on State [education agency] Capacity Building Projects; Emrick, Peterson, and Agarwala-Rogers (1977) on NDN State Facilitators and Developer Demonstrators; Berman, McLaughlin, et al, (1975, 1977) on federal and state agency roles in supporting local educational change projects; the R&D Exchange (1978) on the dissemination and technical assistance activities of USOE Regional Offices, state, and intermediate education agencies; Lotto and Clark (1978) on the dissemination and utilization roles of schools, colleges, and departments of education.* However, only a few of these studies provide adequate information on user impact or benefit aside from impressionistic appraisals offered by the intermediaries. Even in those instances where utilization data exist most studies suffer one or more of the following defects: 1) they did not cover the entire U.S., 2) the sample sizes are too small to provide reliable estimates of aggregate measures of utilization at state or local levels, 3) probability sampling methods were not employed, or 4) data collection methods were not sufficiently standardized or rigorous to assure uniform measurement of all cases.**

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* The content of these several studies are summarized in Hood (July 1978) or Emrick and Peterson (June 1978).

** Among the studies cited Emrick, Peterson, and Agarwala-Rogers (1977) comes closest to avoiding these defects, but it suffers from very small state-level sample sizes.

CONTEXT DIMENSIONS

Conceptual mapping of the dimensions of context indicators presents special problems that are different from those confronted in mapping the production, dissemination, or utilization domains. Selection of context indicators should be based on hypotheses concerning causal or explanatory variables that may be related to other types of indicators or to relationships among indicators. In general, context variables should represent variables, forces or factors that may account for the distribution by geographical or educational sectors of quanity, quality, content, or process characteristics, or other activities of selected production, dissemination, or utilization (PDU) indicators.

The following are some of the major categories of context variables that may prove to be useful.

Individual population data. Population data on the numbers of persons (all persons in an area, school age groups, ethnic groups, number of elementary and secondary education school staff, number of librarians, etc.) may be related to PDU indicators. For higher levels of aggregation, (e.g., USOE regions or states) many of these population indicators are highly intercorrelated.* They can serve as "proxies" for indicators that may be less accessible (e.g., numbers of university faculty that produce educational documentation; number of educational agency staff that serve as consultants; number of potential "consumers" or "users" of educational knowledge).

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* It may be anticipated that at lower levels of aggregation (e.g., SMSA's), intercorrelations among population variables will be less. Attention to selection of appropriate population indicators (e.g., minorities, faculty in schools of education in public universities) will then be important.

Demographic characteristics of populations. These indicators are related to population counts, and may be considered as population data. Examples might be the percentage of the population of an area that is minority, that has completed high schools, that is below the poverty level, that is classified as non-urban. Population density and distribution data may also be relevant to PDU indicators through their possible effect on social stimulation, communication, or the time and costs required to obtain or deliver personal services.

Economic data. Capacity to support PDU activity may be related to the economic resources of a region or more directly to measures of the amounts of these resources that are allocated to education or specific educational sectors or activities. In some cases it may be desirable to adjust economic data for differences in cost of living or purchasing power in different areas. Adjustments may also be needed if data are aggregated over different time periods.

Socioeconomic data. When population and economic data are considered together, various types of socio-economic indicators may be considered. Indicators of this type may be employed to examine issues of opportunity for access or problems relating to differential production or utilization.

Socio-political data. Conceivably, public opinion poll data, especially if pertaining to educational issues, and other types of measures of social or political activity might be related to factors supporting or inhibiting changes or innovations in schools or to the level and type of PDU activity. Specific education-related activity of state legislatures, boards of education, or other social or political bodies may also be relevant (e.g., a state position on minimal competency testing, or state-level support for local school improvement programs).

Educational agencies data. The numbers, types, characteristics, physical location, programs, services, functions, staffing, and funding of educational agencies such as local education agencies, intermediate service agencies, state education agencies, colleges and universities, libraries and information centers, teacher centers, professional associations, may have a bearing on PDU indicators.*

Implications for the Development of Contextual Indicators

This is perhaps the only one of the four indicator areas where there is an abundance of easily accessible data aggregated conveniently at state and local levels of aggregation. Federal sources for many demographic, social, and economic contextual indicators include the National Center for Educational Statistics, the Bureau of the Census, Bureau of Labor Statistics, National Center for Health Statistics, and Statistical Reporting Service of the Department of Agriculture. Although there may be problems in obtaining data disaggregated to state or local levels, other potential sources specific to education include statistical data collected by educational associations, e.g., American Council on Education, National Education Association, American Educational Research Association; opinion polling firms, e.g., the Gallup Poll, National Opinion Research Center; and various specific educational surveys, e.g., National Assessment of Educational Progress (NAEP), the National Longitudial Study of Educational Effects (Project Talent), NCES Surveys of Educational Institutions, the NIE/NASSP Survey of Secondary School Principals, the Bureau of the Census Current Population Survey (CPS) and Survey of Income and Education (SIE), the NEA Survey of the American Public School Teacher.

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* When considering educational agency data the distinction between a context indicator and P,D, or U indicators may depend on the specific situation, e.g., the number of intermediate units in a state might be used as a dissemination structure indicator or as a context indicator.

Finally, there appears to be some potential for reanalysis of some existing data sets, e.g., the Evaluation of the National Diffusion Network (Emrick, Peterson, and Agarwala-Rogers, 1977) or the Education Market Survey (Hood, Mick, and Katter, 1976).

EXPLORATORY DATA ANALYSES

Can the conceptual framework presented above help in designing and interpreting studies of educational knowledge production, dissemination, and utilization? We believe the answer is a definite, yes. The framework provides a multidimensional "sampling space" in which various indicators (independent or dependent variables) may be mapped. When indicators are mapped in this conceptual sampling space, it often becomes apparent that only small part(s) of the space are sampled, and often in peculiar densities. Sometimes it is possible to find or develop additional indicators in order to provide better coverage of the region that is under consideration. When this is not possible, one at least has some sense of probable limits for generalization of findings.

The framework can also be quite useful in suggesting ways to refine aggregate indicators and in considering ways to cross classify various types of indicators.

The results of several lines of exploratory data analyses are described in two recent EDSSP reports.

State and regional analyses. Hood and Blackwell (1979) examined selected state-level and region-level production, dissemination, and context indicators to answer the following questions:

- How are selected indicators distributed among the states and regions?
- What is the relationship among indicators within sets? Can more parsimonious factor scores be created in order to reduce the number of indicators within sets?
- What is the relationship of indicators or indicator factor scores across sets? More particularly, to what extent can contextual indicators be used to predict or account for variation among states or regions in their knowledge production or knowledge dissemination indicators? If so, what do these predictions tell us? Perhaps as important, where do we fail to predict? What new indicators are needed?

- Can these indicators be employed to create typologies of states that may be useful for dissemination planning or analysis?

The data analyses demonstrate that there are substantial and meaningful differences among the regions and the states in the quanities of educational reports and journal articles that they produce, in the document search services and repositories that are available, and in a variety of human linkage and dissemination technical assistance services that are provided. States and regions are also markedly different on many contextual indicators. Factor analyses produced a smaller number of contextual indicator factor scores that can be employed to account for significant amounts of the between state variation in all of thirteen knowledge production and dissemination indicators that were used in this exploratory study. Explained variances ranged from 15 percent to 79 percent. Educational system size and expenditures for education are especially powerful contextual factors that account for over 60 percent of the state-to-state variation in all indicators that are based on counts (e.g., documents produced, search services, JDRP approved projects). Other contextual factors that add very modest increments of predictive variance, especially for qualitative indicators of dissemination capacity, include: presence and distribution of intermediate service agencies and teacher centers, population and school system density, and population change. Prediction tended to be best for document-oriented dissemination services and poorest for qualitative indicators such as existence or status of a SEA state dissemination plan or an Identification, Validation, Dissemination (IVD) process. Some specific results based on multiple regression analyses of data for the 50 states and the District of Columbia are:

- Three contextual factors account for between state variation in the number of RIE documents in ERIC that were produced in each state. Size of the educational system accounts for 66 percent of the covariance, educational expenditures adds 9 percent and population density adds one percent.

- Number of ERIC search services available in each state are also predicted primarily by size (55%), and educational expenditures (7%), but teacher centers, intermediate service centers, and greater expenditure on education relative to per capita income add a small increment (4%).

- R&D Utilization Project linking agent numbers are not strongly predicted (32% total covariance); the predictors include: size (16%), distribution of intermediate service agencies (13%), educational expenditures (2%) and population increase (1%).

The report demonstrates that indicators can be used to create typologies of states on the basis of a) contextual factors or b) dissemination structure indicators. The typologies, although based on completely independent sets of indicators, result in a similar typing of most states. The typologies appear to be useful for selecting states for comparative case study. Analysis at the regional level indicates that the ten USOE regions also tend to differ on many of the same contextual, production and dissemination indicators, thus suggesting that there are major regional effects that operate either directly on educational knowledge production and dissemination or on underlying contextual factors.

Data base and metropolitan/rural area analyses. Paisley, Cirksena, and Butler (1979) analyzed a number of indicators in two exploratory studies of information equity for five groups (migrants, rural, women, disabled, and minorities).

The first study examines the ERIC data base by cross-classification on two dimensions, a) subject matter content and b) audience orientation (a subdimension of the knowledge organization dimension). The ERIC data base analysis suggests that the literature pertaining to some groups may have less depth and breath, document for document, than literature pertaining to other groups.

The second equity issues study examined the geographical distribution of information programs. The remarkable methodological aspect of this study is

that it is based on 334 SMSA/Rural Areas and on 251 SMSAs.* Although extensive census and educational statistical data are available at the SMSA level, the ingeneous part of this study was the creation of a reference file of SMSAs and rural area aggregates to which sets of three digit postal ZIP prefixes could be attributed. Through the ZIP prefix, various data on information sources users,** colleges and universities, and state capitals were fixed as to geographic location.

Among the interesting findings are the following:

- The influence of urbanism (also found by Hood and Blackwell in their analyses at state and regional levels of aggregation) is evident in the fact that larger numbers of resources and users are found in larger cities. However, the presence of colleges and the location of the state capital also accounts for more information programs, more ERIC collections and more users among smaller SMSAs.

- The proportion of resources and the proportion of users are not distributed in proportion to populations. It is in SMSA larger than one million, where 56 percent of the total number of educational dissemination programs serve 41 percent of the population, and in rural areas, where 11 percent of the programs serve 27 percent of the population, that the disproportion is greatest. However, the number of ERIC collections is proportionately greater than population on all SMSAs smaller than one million. (The stronger correlation involving ERIC collections is not with population but with presence of colleges and universities.)

- A sub-analysis of the distribution of women's resources shows a marked tendency for these resources to be concentrated in the larger SMSAs and for the majority of smaller SMSAs and rural areas to have no women's resources.

- Multiple regression analyses show that 66 percent of the covariance in the number of information programs in 334 SMSA/rural areas is predicted by three variables. Number of users alone accounts for 53 percent. Colleges and universities

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* SMSAs - Standard Metropolitan Statistical Areas

** Users in this analysis are person residing in each SMSA/rural area who were identified in samples drawn from the mailing lists of five national information programs.

account for another 8 percent and state capitals add 5 percent. The fourth variable, urban size, adds nothing. When only the 251 SMSAs are analyzed, the covariance rises to 72 percent.

- Predicton of the number of ERIC collections available in 334 SMSA/rural areas shows that number of colleges/universities in the area accounts for 60 percent of the covariance, and number users add 8 percent. Location of state capital and urbanism add nothing. When the 251 SMSAs alone are examined numbers of users is the most powerful predictor, accounting for 67 percent of the covariance, number of colleges and universities adds another 10 percent and location of state capital adds 2 percent.

Other studies. The EDSSP staff are pursuing or planning several lines of investigation, including:

A. Further study of geographic distribution and relationships among indicators at three levels of aggregation--regional, state, and SMSAs.

B. Further examination of data on the distribution of, and services provided to, special populations (e.g., minorities, handicapped, geographically isolated).

C. Development of indicators of utilization, and examination of their use as "dependent" variables in time series analyses of state by state trends and their causal determinants.

D. Development, and analysis of the realiability of and use of subjective indicators (e.g., judgemental ratings of relatively intangible qualities such as "dissemination leadership," or "technical effectiveness").

E. Development of more detailed predictive or causal models designed to account for regional or state variance in dissemination or utilization indicators.

F. Sensitivity analysis of the stability of model parameter estimates.

G. Examination of residual or outlier cases to attempt to account for the reasons for poor fit between data and the predictive models.

CONCLUSION

Most data and information on educational knowledge production, dissemination, and utilization (KPDU) are found in specific researach projects, case studies, surveys, or program evaluations that are usually confined to well defined and often limited areas of investigation. When one attempts to organize the findings from these several sources within a comprehensive conceptualization of KPDU there are difficulties in establishing the boundaries of the area of investigation or the most important organizing parameters or dimensions that should be considered. Moreover, efforts to synthesize findings of various educational KPDU studies are seriously hampered because we lack an acceptable framework for establishing similarities and differences along significant dimensions or for determining how adequately various dimensions are represented. And we have no good basis for indentifying major gaps in the field of knowledge of KPDU. Finally, we run the risk of overgeneralizing from results that may infact pertain to very limited KPDU areas.

These problems beset anyone who attempts to make sense of, or act on, existing knowledge pertaining to educational KPDU. They are particularly exacerbating to those who attempt to develop and interpret KPDU indicators.

There are many disciplines, paradigms, perspectives, theories, models, and other conceptual systems for viewing educational KPDU.* Given the immense complexity of this field, we view this diversity positively, and see no hope or need for achieving one overarching, conceptual framework that would replace or

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* Pertinent references have been cited throughout this paper. For comprehensive overviews with discussions see: Havelock (1969), Rogers and Shoemaker (1971), Gross, Giacquinta and Berstein (1971), Havelock and Lingwood (1973), Short (1973), Shashkin, et al (1973), Galser, et al (1976), Nash and Culbertson (1977), Zaltman, Florio, and Sikorski (1977), and Hood and Cates (1978).

intergrate all others. However, there is need for some kind of a taxonomic scheme to aid in sorting out and organizing the empirical contributions of the various theories, models, disciplines and paradigms that have been or might be employed, and for organizing other data that have no apparent conceptual framework.

The framework offered in this paper represents an initial attempt to identify some taxonomic dimensions that seem to organize most powerfully and practically the many facets of educational KPDU. The dimensions that have been presented are listed schematically in Figure 5.

FIGURE 5

DIMENSIONS OF EDUCATIONAL KNOWLEDGE PRODUCTION, DISSEMINATION AND UTILIZATION

KNOWLEDGE BASE	DISSEMINATION STRUCTURES	UTILIZATION SETTING & OUTCOMES	KPDU CONTEXTS
• Subject Matter Content	• Level	• Resource Type (Repeats Knowledge Base; Dissemination Outputs)	• Population Data

• Structure
  • Form
  • Formality
  • Formats
  • Collections
	• Base (Setting)
	• Services Provided
	• Focus of Services
	• Client Interface
		• User Type
		  • Organizational
		  • Situational
		  • Personal
			• Demographic Characteristics
			• Socioeconomic Data

• Organization
  • Tangibility
  • Interactivity
  • Separability
  • Audience-orientation
	• Source of Initiative
	• Inputs
	• Structures
		• Purpose
		• Scale, Scope, & Complexity
		• Strategy, Tactics & Methods
			• Sociopolitical Data

• Basis
  • Disciplined-inquiry
  • Sponsorship
	• Outputs
	• Contexts
		• [Methods of Inquiry]	• Educational Agency Data

Please note that these particular dimensions have been selected on the basis of their ability to organize the complete domain of educational KPDU data. Other conceptual frameworks may be far more useful for pursuing specific lines of inquiry within a particular paradigm. Hence, we are not suggesting that this framework is anything more than a relatively comprehensive dimensional taxonomy that may be useful for organizing KPDU data or for planning the scope of new studies.

Each of the first three sets of dimensions (for knowledge base, dissemination structures, and utilization settings and outcomes) are self-contained, consequently there are some partial redundancies across the dimensional sets. Note that the full set of knowledge base dimensions may be considered in analyzing the "Input" resources of the dissemination structures set, and for analyzing the "Resource Types" of the utilization set. The dissemination set and the utilization set are double linked, since analysis of "Output" of the dissemination set may incorporate all of the dimensions of the utilization set, while the "Resource Type" of the utilization set reflects the client's view of the dissemination structures' "Client Interface" and its "Outputs." Although these linkages exist, the redundancies are not complete, e.g., the "Outputs" of one or even several dissemination structures may not equal the full set of Resource Types of a particular utilization setting; the knowledge base that exists nationally is not the same as the base that is accessible to a particular dissemination service or a particular client group. For these reasons, we have deliberately retained overlaps in the dimensional sets.

Note also that this entire set of dimensions focuses primarily on dissemination and on utilization. The knowledge production system is represented only

in terms of its knowledge base outputs.* The ten dimensions associated with dissemination structures appear to be the most complete, however the five dimensional classes of the utilization set encompass many complex sub-dimensions.

In various places throughout this paper we have given examples of how analysis in terms of these dimensions can inform us concerning our knowledge of educational KPDU. For example, most of our detailed information about the educational knowledge base refers only to the more formal types of documents and materials that are indexed by national information systems. We know very little about the content of knowledge that is communicated orally of informally. Although we know a great deal about the wide variety of kinds of educational dissemination services, we have very little comprehensive information about the nationwide distribution of most non-library services. In the utilization domain, we encounter a similar situation, in which several lines of inquiry have produced a rich mass of desciptive information, but aside from relatively superficial survey data, we lack any kind of accurate nationwide indicators of educational knowledge utilization.

Despite these major problems concerning the availability of KPDU data, exploratory studies suggest that it is possible and useful to develop and analyze KPDU indicator data at three levels of aggregation: regional, state, and local. The dimensional taxonomy simply reminds us that there are sometimes severe limits on our ability to generalize KPDU findings.

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* Note that there is no explicit point of input from dissemination or utilization to the knowledge base because this is an incomplete set that considers only the output part of knowledge production rather than the entire production process.

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APPENDIX A

RESEARCHER-ORIENTED STUDIES OF EDUCATIONAL KNOWLEDGE COMMUNICATION AND UTILIZATION

Information concerning knowledge utilization by educational R&D personnel comes primarily from two sources: analyses of formal and informal communication behavior of educational researchers, and user needs studies which have treated educational researchers as one of several subgroups. With a few exceptions, the focus has been on researchers, as opposed to development, dissemination, or evaluation personnel. Moreover, our information is typically biased toward the more active researchers who publish and attend national meetings.* Although a substantial body of research on information needs and use exists in areas such as science, engineering, and psychology, data regarding communication and information use within educational R&D is relatively recent (Dershimer, 1970; Nelson, Garvey, and Lin, 1970; Nelson, 1970; 1972a, 1972b; Short, 1973).

The picture of information flow that has begun to emerge is generally similar to that produced by other studies in the social sciences (e.g., Brittain, 1970; APA, 1963; Lin, Garvey, and Nelson, 1970). These studies, which focus chiefly on annual professional meetings and formal publications, provide the following characterization:

1. The scientific communication system in education does not differ greatly from other disciplines but it does seem to embrace much more random information exchang

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* The extent of this bias is unknown but may be gauged very roughly by data presented in the Oregon Studies in Educational RDD&E (Shalock, et al, pages 84-87) which show that 40 percent of professional RDD&E project personnel had not published at all, and another 21 percent had published no more than three times; less than half of these RDD&E personnel belonged to any professional association.

2. The interval between inception of work and presentation at a national meeting is generally longer in the social sciences than in the physical sciences. Nearly three years elapse between inception of work and journal presentation, and another year or two may elapse before the work is indexed and reviewed. Consequently, our latest knowledge production indicators may be reflecting research work that, on the average, was commenced four or five years previously.

3. The informal network associated with premeeting and prepublication information exchange is poorly structured, e.g., only 40 percent of authors publishing in seven core educational research journals distributed preprints and only 45 percent had made oral reports on the contents of their journal articles. These prepublication exchange rates for education researchers are among the lowest of all disciplines that have been studied.

4. The formal publication system in education is extremely diffuse. CIJE indexes over 700 periodicals. Studies by Carnot Nelson and others show that a reader would have to read 18 to 20 journals to cover one-half the journal sources for research reported at AERA annual meetings. The journal literature in education is typified by an article which reports the results of a single study, done by an author who never published anything else in the area. Although there is evidence for much tighter communication among persistent, active researchers in the "same area," most of the educational research literature is produced by individuals operating almost completely independent of close informal communication with other investigators.

5. Studies of information use during the conduct of an educational research project (see immediately below) suggest that external sources of information are not often sought during the planning stages, and that most information seeking is confined to the later analysis and report preparation stages.

6. These studies suggest that the great majority of, but not all, educational researchers operate in poorly structured communication environments that apparently do not strongly support or encourage effective knowledge utilization during project planning stages or effective communication of results on project completion.

Nelson and Wickoff (1973) provide a detailed picture of information needs and sources used as a function of type of research activities as reported by 260 authors who had published in seven "core" educational research journals over a 26 month period. This study of information use in educational research

is among the most comprehensive to be undertaken in this area. The stages of research and the percentage of times that the authors stated that they especially needed and sought information beyond their own knowledge at that stage in their research are displayed in Table A-1.

TABLE A-1

USE OF INFORMATION DURING THE CONDUCT OF EDUCATIONAL RESEARCH PROJECT

Stage of Research	Proportional Use (%)	
Preliminary Planning	4.4	
Preparation of Proposal	3.3	
Conceptual Planning	6.5	
Apparatus Design Planning	1.0	20.0 Planning
Study Design Planning	3.5	
Other Planning	1.3	
Calibration, Pretesiting, etc.	1.9	
Preliminary Experimentation, Field Trials, or Mockups	8.9	18.2 Collection
Collection of Data	7.4	
Analysis of Results	9.0	24.1 Analysis
Interpretation of Results	15.1	
Preparation of Report	37.7	37.7 Reporting

The potential value of the classification of information need by stage of research is clearly evidenced in this table which indicates that only a fifth of the information these 260 authors sought was required during research planning stages, whereas over sixty percent of the information was sought during analysis or report preparation stages. The Nelson and Wikoff study also indicates that educational researchers encounter a wide variety of information needs. See Table A-2. (Note that percentages reported in Table A-2 exceed 100 because the same information seeking activity may be classified as meeting more than one class of information needs.) The Nelson and Wikoff study also provides several cross classifications (e.g., information need as a function of stage of research; information source as a function of stage of research).

TABLE A-2

AUTHOR'S INFORMATION NEEDS
(N=192)

Information Needs	Percent *
Perception or definition of problem	38.5
Formulate scientific or technical solution	28.1
Place work in proper context with similar work	47.9
Relate work to ongoing work	43.8
Select design strategy for data collection	29.2
Select data gathering technique	23.4
Design equipment of apparatus	16.7
Choose data analysis technique	34.4
Enable intrepretation of data	3[illegible].8
Integrate findings into current state of knowledge in area	38.5

* Percent totals more than 100 since the same information search may be associated with more than one need.

APPENDIX B

PRACTITIONER-ORIENTED STUDIES OF INFORMATION NEEDS AND USE

In general, the information utilization behavior of practitioners and of other types of educational groups has not been studied as closely as that of educational researchers. However a number of studies are available (Mersel, 1966; Hood and Hayes, 1967; Chorness, Rittenhouse, and Heald, 1968; White, 1968; Kromer, 1969; McCracken, 1970; Rittenhouse, 1970a, 1970b, INFROSS, 1971; Magisos, 1971; Fry, 1972; Hull and Wanger, 1972; Mick, Paisley, et al., 1972; Sieber, Louis, and Metzger, 1972; Hood and Blackwell, 1976; Hood, Mick, and Katter, 1976). Although these studies were conducted for many different purposes and employed different samples, questions, and types of analyses, some reasonably consistent generalizations can be derived, namely:

1. Educational practitioners (e.g., teachers, instructional support staff, administrators, governance groups) occupy different positions and play many different roles. These different positions and roles imply different types of information needs. Accordingly, a great variety of information seeking and using behavior is encountered.

2. Educational practitioners may report problems in acquiring and using the information they need for planning, decision-making, instruction, practice improvement, etc. They find that some types of information do not seem to get into print at all and that if they do, the information is not easily located or retrieved. When practitioners do obtain pertinent R&D-based information, they often complain that it is in unsuitable formats, too lengthy, or not presented in easily understood language.

3. Generally, practitioners require relatively small amounts of information from a large and highly diverse body of information, and usually they have seriously restricted time for gathering and using it. Compounding this problem is the fact that most practioners have had relatively little formal training in information search and retrieval. Moreover, the organizational, social, and cultural systems of most educational practioners provide relatively few rewards

for highly systematic search and use of external source of information; hence motivation for seeking and use is typically low.

4. Generally, the local, easily accessible sources (people in own organization, notes or files in own office, personal library, journals, newsletters, memos and correspondence) are the most frequently used sources. Contacts (face-to-face or by telephone) with people in other organizations follow. Next come more formal information sources (library or resource center in own organization; office, department or organization files). Conventions, professional association meetings and workshops, seminars and graduate courses are much less frequently used. Textbooks, reference books, and curriculum materials are frequently used by all practitioners directly concerned with instruction, but are far less frequently used by other types of educational groups. Technical reports; libraries; resource centers, or information services that are not close by, and abstracts, indexes and bibliographies are used much less frequently by most user groups.

5. Within this general pattern of relative frequency of use of different sources there are significant differences according to the individual's position or role. Instructional staff tend to be more frequent users of libraries, textbooks, and curriculum materials and, relative to other educational groups, less frequent users of interpersonal sources (face-to-face discussions and telephone calls). Administrators, by contrast, make substantial use of all interpersonal sources and are also heavy users of memos, correspondence, and own office and organization files. Governance groups (local and state school board members, state legislators, U.S. Congressional aides) display great similarity in sources not used frequently (e.g., abstracts, indexes, and bibliographies; curriculum materials; personal library; conventions and professional meetings).

6. With a few exceptions, educational practioners with manifestly different work activities, requiring different types of information and with markedly different preferences for types of sources, display many similarities in the reasons they give for their preferences for the different sources they use. Regardless of the type of source preferred, most practitioners are likely to turn to this source because the source: 1) is likely to have the wanted information, 2) is near at hand or easily accessible, 3) is responsive to the individual's particular problem or question, 4) is easy to use, and 5) is usually available when needed. By contrast among the least important characteristics of a preferred source is that it: is objective, impartial, not biased; is free or inexpensive; or is complete or comprehensive.

7. Among different educational information user positions there are statistically significant differences in need for information for different purposes, thus confirming a possibly obvious assumption that different types of users would have different purposes for seeking information. However, despite these significant differences, a strong general pattern tends to characterize most user groups. Overall, the purpose which shows the greatest need for information is keeping aware of developments and activities in education. The second most important is need for information to find specific answers to questions arising in relation to the individual's own work. Identifying new sources of assistance for improveing one's own work and developing alternative approaches to solving problems are also relatively high in need for information. By contrast, most practitioner user groups have only moderate or small need for information in order to prepare reports, articles, or speeches.

8. Aside from general information about relative frequency of use or users' ratings of importance of information for different purposes, we have relatively little information concerning actual use or benefit. The Education Information Market Study (Hood and Blackwell, 1976) based on field interviews with 137 key educational information users, representing 18 different educational roles and located in over 40 communities throughout the U.S., suggests all those interviewed are heavily engaged in responding to requests for information and spend substantial amounts of their time in responding to such requests. When asked to identify a particular major task or activity completed in the past month in which they were successful in getting information they really needed or wanted, 40 percent indicated that the primary end use was to report specific findings to others; another 27 percent incorporated the information into a larger communication; the remaining 33 percent applied the information in some personal task. However, over 90 percent said they passed this "critical incident" information on to others; of those passing it on, 26 percent passed it along to others as is, 38 percent summarized it, 30 percent interpreted or evaluated it, and 6 percent gave responses that could not be classified.

   User groups differ both in the number of persons that come to them for information and in how they transform information that they provide to others. Teachers estimate that less than a hundred persons per year come to them seeking information, school principals average two hundred persons a year, state and local education agency staff report an average closer to eight or nine hundred persons a year, while state and local school board members average between four and five hundred persons a year. School principals (and U.S. Congressional aides) interpret or evaluate nearly all the "critical incident" information they provided to

others. Other groups which tend to interpret or at least summarize much of the information they provide to others include: college of education faculty, state agency staff, information center staff, supervisors of instruction and school district staff. Among the groups with greater propensity to pass information along to others "as is" are special interest group representatives, intermediate unit staff, state legislators, and state agency dissemination and information staff. Perhaps the major significance of these data are that the information requester may not be, and most probably is not, the ultimate end user.

9. Regarding ulitmate end use, the Pilot State Demostration Program (Sieber, Louis, and Metzger, 1972) at least provides a rough index of utilization based on 682 client requests in the three PSDP states. Approximately 60 percent could identify no specific use or few benefits derived from the information that was delivered. The remaining 40 percent identified some use; but only seven percent could identify a specific practice or program that was implemented, 14 perent identified other general uses (e.g., planning or proposal writing) and also checked a higher than median number of additional ways in which the information or assistance helped them. Among the most frequent benefits cited by PSDP clients are the following:

(57%) I learned something new
(51%) It gave me new resources for helping other staff members
(38%) It provided [one of four] specific pupil benefits
(34%) It made my job easier
(30%) It helped with an administrative problem
(29%) It improved my skills
(26%) It helped in preparing a speech, report, or article
(21%) It helped me to have greater self confidence
(19%) It helped me develop instructional packages.

10. Most practitioners display an annual cycle of information use corresponding to the school calendar. Monthly need rises sharply in September, drops off slowly to December, rises again in January, and is at average levels until May. Needs in June, July, and August are about half that for the remainder of the year. Other calendar cycles exist for legislative and fiscal activities, but these cycles are not well documented.